Chapter 3
Environment and Effects

CHAPTER 3 – ENVIRONMENT AND EFFECTS

Introduction

This chapter provides a description of the existing environment in the Big Thorne project area and potential environmental effects of the alternatives. It also presents the scientific and analytical basis for the comparison of alternatives presented in Chapter 2.

Following each resource description is a discussion of the potential environmental effects associated with the implementation of each alternative. All significant or potentially significant effects, including direct, indirect, and cumulative effects, are disclosed. Effects are quantified where possible; qualitative discussions are also included. The means by which potential adverse effects will be reduced or mitigated are described in the unit and road cards in Appendices B and C of the Draft Environmental Impact Statement (EIS), respectively. In addition, unit and road cards for the Final EIS are in the Big Thorne Project record and unit and road cards for the Record of Decision (ROD) are included in appendices to the ROD.

The discussions of resources and potential effects includes existing information documented in the 2008 Tongass Land and Resource Management Plan (Forest Plan) Final EIS (USDA Forest Service 2008c), other project EISs, project-specific resource reports, the results of field investigations, and other sources as indicated.

Land Divisions

The land area of the Tongass National Forest has been divided in several different ways to describe the resources. These divisions vary by resource since the relationship of each resource to geographic conditions and zones varies. The allocation of Forest Plan land use designations (LUDs) is one such division. Other divisions important for the effects analysis are described briefly here.

Project Area

The project area is identified by the interdisciplinary team (IDT) to define the boundary around the area in which the project will occur. The Big Thorne project area is approximately 232,000 acres in size; 48,500 acres are considered suitable for timber production. The project area includes approximately 14,000 acres of non-National Forest System (NFS) (State and private) land (see Figures 1-1 and 1-2).

Value Comparison Units

Value comparison units (VCUs) are distinct geographic areas, each encompassing a drainage basin containing one or more large stream systems. The boundaries usually follow major watershed divides. The Big Thorne project area includes 16 VCUs. Figure 1-2 in Chapter 1 shows VCU boundaries and numbers.

Game Management Units

Game management units (GMUs) are geographical areas defined by the Alaska Department of Fish and Game (ADF&G) to manage wildlife populations. Legal hunting and trapping regulations govern each unit. There are 26 GMUs in the State of Alaska, 5 of which are in Southeast Alaska. Prince of Wales Island is in GMU 2.

Wildlife Analysis Areas

Wildlife analysis areas (WAAs) are land divisions used by the ADF&G for wildlife analysis and regulating wildlife populations. The project area includes portions of five WAAs, but project activities affect the following four WAAs: 1315, 1318, 1319, and 1420 (Figure 3-1). Information estimated by WAA is used in the wildlife and subsistence analyses.

Watershed

Watershed refers to the area that contributes water to a drainage or stream and to the portion of a forest in which all surface water drains to a common point. Watersheds can range from tens-of-acres that drain a single, small intermittent stream, to many thousands-of-acres for a stream that drains hundreds of connected intermittent and perennial streams. There are 21 watersheds and 48 subwatersheds with at least a portion of their drainage areas within the project boundary. The EIS analyzed 13 watersheds and 37 subwatersheds with proposed ground disturbing activities (see Figures WTR-1 and WTR-2 under Issue 4–Cumulative Watershed Effects).

Inventoried Roadless Area

Inventoried roadless areas (IRAs) are undeveloped areas typically exceeding 5,000 acres that met the minimum criteria for wilderness consideration under the Wilderness Act and that were initially inventoried during the Forest Service's Roadless Area Review and Evaluation (RARE II) process, subsequent assessments, or Forest planning. These areas have been modified since that review due to road construction and timber harvest. The inventory used for this project is the 2001 Roadless Rule inventory; the IRAs are identified in the set of inventoried roadless area maps contained in the Forest Service Roadless Area Conservation, Final Environmental Impact Statement Volume 2 dated November 2000. This is the inventory used for analysis for the Big Thorne Project. The Big Thorne project area includes portions of four roadless areas: the Kogish (#509), Karta (#510), and Thorne River (#511) IRAs are partially within the project area and the Ratz (#512) IRA is entirely within it (see Figure IRA-1 under Roadless Areas).

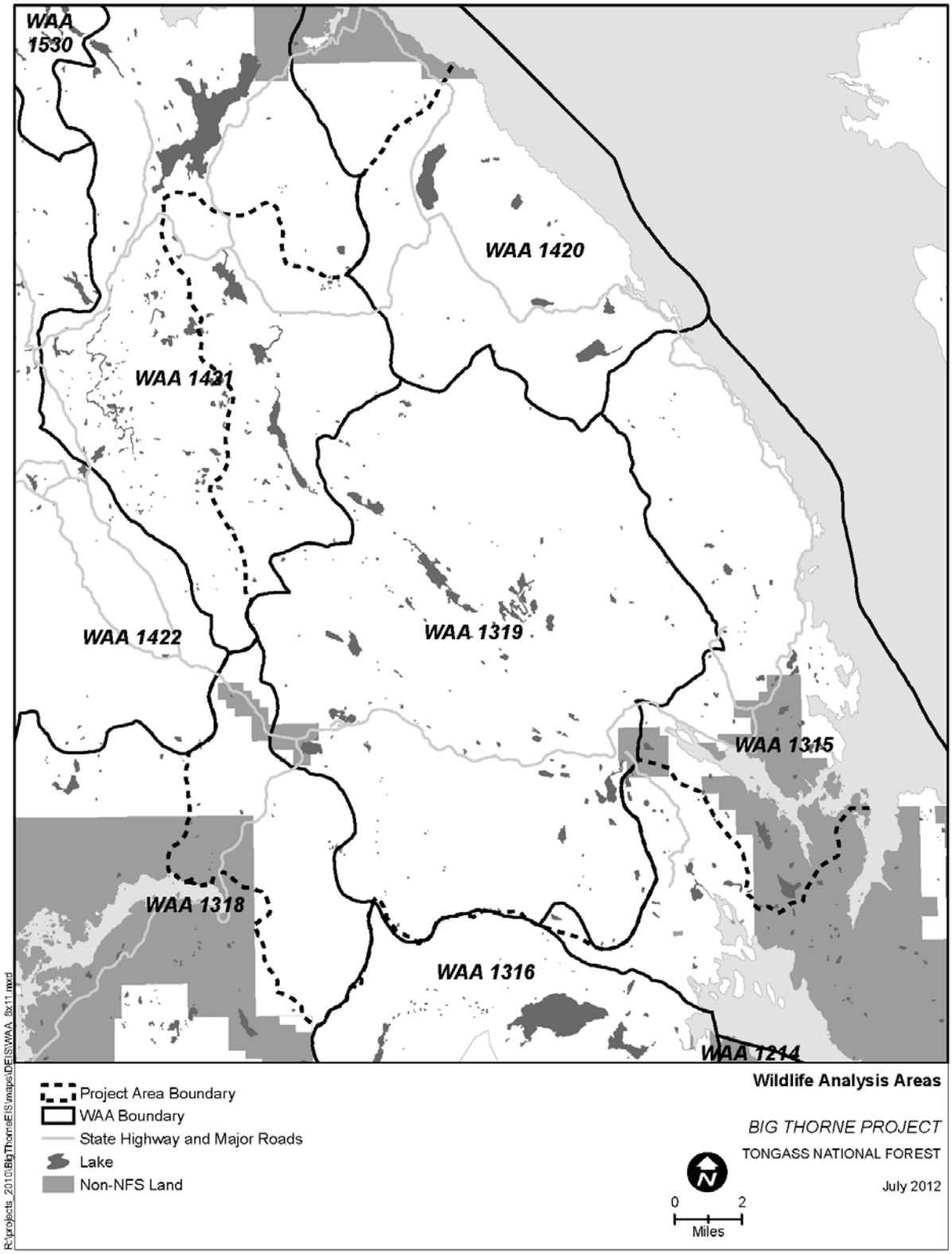

Figure 3-1. Wildlife Analysis Areas (WAAs) in the Big Thorne Project Area

Biogeographic Province

A biogeographic province designation refers to 21 ecological subdivisions of Southeast Alaska that are identified by generally distinct ecological, physiogeographic, and biogeographic features (See map in the Forest Plan FEIS, p. 3-132). Plant and animal species composition, climate, and geology within each province are generally more similar within than among adjacent provinces. Historical events (such as glaciers and uplifting) are important to the nature of the province and to the barriers that distinguish each province. The Big Thorne project area is located in Biogeographic Province 14, the North Central Prince of Wales province. Effects of management at this scale were analyzed during the Forest Plan analyses and are also conducted for some analyses in this document. The botany cumulative effects analyses includes Biogeographic Provinces 14 and 18, which covers all of Prince of Wales Island and many adjacent islands.

Analyzing Effects

Environmental consequences are the effects of implementing an alternative on the physical, biological, social, and economic environment. The Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) include the following specific categories to use for the analysis of environmental consequences.

Direct, Indirect, and Cumulative Effects

Direct environmental effects are those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity. Cumulative effects result from incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such actions. Reasonably foreseeable actions are those that are currently planned or scheduled to occur. The 5-year timber sale plan is the instrument through which future timber sales are scheduled. Therefore, for the purpose of this analysis, reasonably foreseeable future actions are generally considered to be those that are expected to occur within the next 5-10 years.

In the Environmental Consequences sections, the direct and indirect effects are presented first, followed by cumulative effects. For the purpose of evaluating cumulative effects, the IDT considered all lands in the project area. For some resources, an expanded boundary was evaluated. The cumulative analysis area for each resource is described in the appropriate section later in this chapter.

Under CEQ regulations and for the purposes of this analysis, “impacts” and “effects” are synonymous and interchangeable.

Past, Present and Reasonably Foreseeable Projects

Past Projects

Past projects considered in cumulative effects analysis generally are physically located on the landscape, such as roads. The past projects combined with the natural environment, represent the affected environment that is described for each resource in this chapter. These projects include timber harvest, thinning of harvested stands, recreation developments, road construction and LTF construction; housing and building development in towns of Thorne Bay and Coffman Cove, and dispersed private lands; and highway construction. The past timber harvest projects are cataloged in Appendix D – Part I, which lists acres of harvest by year, by stand, by VCU, and by ownership within the project area.

Present and Reasonably Foreseeable Projects

The following projects are either present actions or are considered reasonably foreseeable actions and are combined with past projects to be considered in the cumulative effects analysis. They include timber harvest, thinning, road construction, restoration activities, recreation improvements, and others. Reasonably foreseeable future projects are those with a developed proposed action. These are analyzed quantitatively if they can be identified spatially and qualitatively if the location is not definite. The following subsections describe the present and reasonably foreseeable projects and Appendix D – Part II presents a summary of these projects and identifies to which analysis areas they apply.

Timber Harvest on NFS Lands inside Project Area

Micro-sales from the Roadside Salvage Environmental Assessment (EA) will continue to occur throughout the project area along existing roads. These sales are limited to dead or down trees and usually involve only a few trees per sale. They are reviewed by resource specialists and are subject to the same standards and guidelines as the Big Thorne Project. In Fiscal Years 2011 and 2012, Roadside EA micro-sales cumulatively amounted to about 7 to 10 acres per year. Locations cannot be accurately predicted in advance; cumulative harvest would likely involve no more than a few acres in each watershed for micro-sales in the foreseeable future. No new roads would be constructed. It was assumed that up to 50 acres would be affected by microsales, including any microsales along the roads to be left open up to 5 years.

Free Use timber harvest is also expected to occur. This can be up to 10 thousand board feet (MBF) of saw timber and up to 25 cords of wood per person per year (for Alaska residents only). Green sawtimber must also be evaluated and approved by the Forest Service prior to their removal. Free Use removal is expected to have similar effects as micro-sales, although they may include more live standing trees. It is assumed that up to 10 acres would be harvested in the project area

Previously NEPA-approved projects that include unharvested units, also account for reasonably foreseeable future harvest. These unharvested units were approved by the decision on the Control Lake EIS (1998). Harvest of these units could include up to

approximately 351 harvest acres and approximately 1.2 miles of road construction. These units are all within the southwestern portion of the project area with 58 acres in VCU 595 (Steelhead drainage), 83 acres in VCU 596 (Control Lake area), and 211 acres in VCU 597.2 (Rio Beaver and Goose Creek subwatersheds).

Timber Harvest on NFS Lands outside Project Area

Timber harvest and road construction on NFS lands outside the project area but within Biogeographic Provinces 14 and 18 are considered since this analysis area is used for some resource cumulative effects analyses. The projects included here are those that have been NEPA-approved. In addition, as this Final EIS goes to press, the Kosciusko Vegetation Management project is getting closer to this stage and could be deemed reasonably foreseeable.

For Biogeographic Province 14 the NEPA-approved projects with remaining harvest units include the Logjam (2009) and Soda Nick (2007) projects. The Logjam project is adjacent to the Big Thorne project area on the northwest side. It was approved for 73 MMBF of old-growth timber harvest from 3,422 acres. It included 5 miles of NFS road and 17 miles of temporary road construction and 3 miles road reconstruction. The Soda Nick project is another previously NEPA-approved project located south of the project area and southeast of Craig and Klawock. It includes an estimated 257 acres of timber harvest. The Dargon Point project was NEPA-approved in February 2013 and includes about 70 acres of commercial thinning or clearcutting and about 1 mile of road construction. It is located northwest of the Big Thorne project area near Naukati. The Dargon Point project is also expected to improve forage availability for deer. For Biogeographic Province 18, only one additional NFS timber sale project is included. The Chasina project (1998) has mostly been harvested but includes approximately 300 unharvested acres near Chasina Point southeast of Cholmondeley Sound.

In addition, in Biogeographic Province 14, the Kosciusko project, which does not yet have a published NEPA document, currently proposes 180 acres of old-growth harvest using clearcutting and up to 6,000 acres of young-growth commercial thinning. To access this harvest, there would be 2 miles of proposed road construction, 16 miles of road reconstruction, and 15 miles of reconstructed decommissioned roads. The 180 acres of proposed old growth harvest on Kosciusko Island would not likely result in any measurable change to deer model results for Biogeographic Province 14 (greater than 1.5 million acres). The commercial thinning of older young growth acres would likely be considered a benefit to deer by improving forage availability.

Timber Harvest on State Lands inside Project Area

Small to large harvest units totaling about 635 acres and 4 miles of road construction are scheduled on State lands in 2011 to 2015; these are identified as the North Thorne Bay/Beach Road Area timber sales and the South Thorne Bay Area timber sales (ADNR 2011). Small sales may occur in the North Thorne Bay area, and are included in the total harvest and road figures. Harvest unit acres and road miles were estimated from the current State Five-Year Schedule of Timber Sales (ADNR 2011). These timber sales would occur in the Pin, Thorne, Thorne Bay, Salamander, and Deer Creek subwatersheds.

No other harvest or roads are reasonably foreseeable on State lands in the project area. State land harvest must comply with the Alaska Forest Resources and Practices Act and Regulations, rather than the Tongass Forest Plan standards and guidelines.

Timber Harvest on State Lands outside Project Area

Timber harvest and road construction on State lands outside the project area, but inside Biogeographic Provinces 14 and 18, are listed here because this analysis area is used for some resource cumulative effects analyses. These harvest units and road miles are derived from the State's Five-Year Schedule of Timber Sales (ADNR 2011). They include an estimated 2,170 acres of old-growth harvest, 400 acres of older young-growth harvest, and 13.3 miles of new road construction. State land harvest must comply with the Alaska Forest Resources and Practices Act and Regulations, rather than the Tongass Forest Plan standards and guidelines.

Road Management on NFS Lands

As a result of the Prince of Wales Island Access Travel Management Plan (ATM) road storage, decommissioning, motorized trail development and other roadwork will be implemented in the foreseeable future as funding is available. The ATM was completed in 2009 (USDA Forest Service 2009a). The Prince of Wales Island Road Storage contract has been awarded and includes approximately 25 miles of road storage work within the project area. This contract is scheduled for completion in 2012.

Maintenance and reconditioning of existing NFS roads is an ongoing process that occurs on a periodic basis. Normally this type of work is determined to fit the category of routine repair and maintenance of roads that do not individually or cumulatively have a significant effect on the quality of the human environment and may be categorically excluded from environmental analysis (Forest Service Handbook [FSH] 1909.15, 31.12). The maintenance and reconditioning of NFS roads in the project area may occur before, during, and after the project analysis. This work is done through separate service contracts to reduce the backlog of deferred maintenance, recondition roads to comply with BMPs, and maintain the existing infrastructure for National Forest Management activities. The timing of this work may coincide with this projects analysis, but is not part of this project. Any effects from ongoing road maintenance and reconditioning work are included in the cumulative effects analysis for this project.

Young-growth Treatments on NFS Lands

Pre-commercial thinning of even-age young-growth stands will occur across the Big Thorne project area in the future. Currently there are approximately 12,300 acres that are expected to need pre-commercial thinning (PCT) over the next 10 years. This includes about 2,450 acres in non-development LUDs including Old-Growth Reserves and Scenic River (Thorne River Corridor), 75 acres in beach and estuary buffer, 4,980 acres in development LUDs (identified by the project wildlife biologist as priority), 950 acres within riparian management areas (RMAs) and 3,850 acres in Timber Production LUDs without a wildlife priority (R. Sheets, Prince of Wales zone silviculturist, personal communication, February 2012).

About 1,500 acres of PCT of project area young-growth stands is scheduled in the next 5 years, and has been NEPA-cleared for the Naukati, Coffman Cove, and Thorne Bay areas (B. Case, personal comm. 2011).

The only commercial thinning that has occurred in the project area to date is 6 acres near Gravelly Creek. The no action and the proposed action alternatives do not include commercial thinning; three of the action alternatives do include commercial thinning.

Restoration Activities in the Project Area

Ongoing replacement of culverts in the project area is reasonably foreseeable and will be conducted as funding allows. In addition, there is currently a separate and ongoing collaborative process to identify stewardship projects in the Big Thorne area. These activities include watershed and wildlife restoration planning. Activities are likely to include young-growth thinning for wildlife habitat and stand improvement which help to achieve older forest conditions at a younger age, riparian young-growth thinning to enhance large-woody debris (LWD) recruitment, LWD placement in streams, fish passage remediation (culvert replacement or removal for "red pipes"), erosion control, road relocation due to resource concerns, road storage and decommissioning, recreation site improvements, and invasive species control. These activities would be subject to Forest Plan standards and guidelines, including BMPs to ensure water quality standards are achieved.

A number of documents are at various stages of planning and will identify past, current, and future restoration efforts. These include:

- **Cobble Landscape Assessment (2004)** – Outlined/described overall landscape condition and described opportunities for moving the landscape towards desired future condition.
- **Cobble Watershed Restoration Plan (2006)** – Detailed description of restoration opportunities. Some terrestrial and riparian thinning occurred primarily in the Ratz and Cobble Creek watersheds and instream habitat improvements occurred in Sal Creek and small tributaries of Big Lake, as a result of this effort. Most of this work occurred in the middle to late 2000s.
- **Luck Lake/Eagle Creek Watershed Restoration Plan (2011)** – This document thoroughly describes and prioritizes riparian, instream, and road restoration/improvement opportunities for the watershed. Approximately 98 percent of the area covered by the Watershed Restoration Plan (WRP) is within the Big Thorne Project boundary. The WRP restoration goals and objectives are tiered to Desired Future Conditions and restoration objectives defined in the 2008 Tongass Forest Plan. High priority projects include five stream restoration projects, six road closures, and four riparian thinning projects. A landslide restoration project was completed in 2012 and approximately 65 acres of riparian thinning are scheduled for completion in the Luck/Eagle watershed in 2013. Most instream habitat improvements would occur in 2013-2014. Upland habitat improvements, road storage/decommissioning, and red pipe removal/replacements would be ongoing. This project is the Fish, Watershed, and Wildlife program's watershed restoration focus starting in 2012 and will likely continue through 2015.

- **North Thorne River Watershed Restoration Plan (2011)** – This plan was recently completed, but is still in draft form. It primarily outlines riparian restoration/improvement and road storage/decommissioning opportunities in the North Thorne watershed. The area covered by the WRP is entirely within the Big Thorne project boundary. Of the WRP identified actions, the highest priority actions include 84 acres of riparian thinning; 12.4 miles of road stormproofing, storing, and decommissioning; restoring access to 3.5 miles of stream; and instream structure placement and channel restoration at three sites. Project work would be ongoing.
- **National Watershed Condition Framework (2011)** – This nation-wide Forest Service program and its website (http://www.fs.fed.us/publications/watershed/) depicts and describes watershed condition on NFS lands at a national scale. It provides a means to identify and prioritize restoration opportunities. Luck Lake watershed is identified as a Tongass priority watershed. The database also depicts the "frontal" watersheds between Thorne Bay and Coffman Cove as "functioning at risk" (i.e., focus areas for watershed restoration opportunities). The Forest Service program has not yet fully assessed the project-specific restoration opportunities in this area at this time.

Outfitter Guide EA

The Decision Notice for the Prince of Wales Island Outfitter Guide Management Plan EA was signed in August of 2012. The management plan identifies the allocation of commercial recreational use on Prince of Wales Island and it would affect the amount of outfitter and guide use in a specific area. It does not set use levels for unguided visitors.

Recreation Projects

The Forest Service has a number of recreation projects proposed for completion in the next 5 years, subject to funding. These projects include six projects at or near existing developed recreation sites and one new cabin proposed for the beach near Sal Creek (see below). They are considered in the analysis of cumulative effects for recreation and scenery.

- **Gravelly Creek Trail** – This project would extend the Gravelly Creek Trail 0.5 mile from the Gravelly Creek Picnic Area to the Falls Creek Pull-off on the Thorne Bay Highway. This project would improve the existing primitive access to the Thorne River.
- **Honker Divide Canoe Route** – This project would improve the portages along the canoe route by constructing boardwalk, step-and-run stairways, and by hardening some surfaces with gravel. A new shelter on Thorne Lake is also proposed as part of this project.
- **Balls Lake Trail** – The plan is to complete the trail by hardening the natural tread sections with step and run stairways and gravel. Bridges also need to be replaced.
- **Luck Lake Day Use Area** – A shelter is proposed on Luck Lake near Eagle Creek.

- **Boyscout Multiuse Trail (3017-3018 Roads)** – This project would install two new bridges along this stored road system to expand off-highway vehicle (OHV) use of the area by an additional 17 miles. The bridges would be placed on Lava Creek and Slide Creek.
- **Control Lake Cabin** – This project involves reconstruction of the small dock at the Control Lake Cabin.
- **Sal Creek Cabin** – The Forest Service proposes to construct a new cabin on the beach near Sal Creek. This project would include the re-opening of a small road, construction of less than 0.5 mile of trail, and construction of a young-growth cabin.

Mineral Exploration Activities in Southern Prince of Wales Island

For sensitive plants, the cumulative effects analysis area includes Biogeographic Province 18 (southern Prince of Wales Island) and includes the Niblack and Bokan Mountain areas, which have had mineral exploration and some extraction for 50-100 years. Current activities on NFS lands are limited to exploration drilling using helicopter access; small wooden platforms are constructed at the drill sites. An EA was completed for exploration on Bokan Mountain in 2012. A continuation of these exploration activities is reasonably foreseeable.

Sealaska Remaining Land Entitlement and Land Legislation

In 2011, land legislation (S.730/HR1408) was introduced into Congress; these bills would allow Sealaska Corporation to acquire 65,000-80,000 acres of roaded, managed NFS land parcels, which they have identified on Prince of Wales, Kosciusko, Kuiu, and Tuxekan Islands in place of their final Alaska Native Claims Settlement Act of 1971 (ANCSA) entitlements for which they filed for conveyance in June 2008 with the Bureau of Land Management (BLM). Previous iterations of this controversial bill, introduced since 2007, have been opposed by the public, nearby communities, and various user groups. The Big Thorne project area is not among the NFS lands included in this bill. However, appropriation of NFS lands by the Corporation would have overall implications for the future of public land management on Prince of Wales Island and in Southeast Alaska and implementation of the Forest Plan.

New land legislation (S. 340/H.R. 740) was recently introduced into Congress; these bills would convey to Sealaska Corporation 70,075 acres of roaded, managed parcels on Prince of Wales, Kosciusko, Kuiu, and Tuxekan Islands. This would be in full satisfaction of their entitlement under the Alaska Native Claims Settlement Act. Previous iterations of this bill, introduced since 2007, have been opposed by the public, nearby communities, and various user groups. The Big Thorne project area is not among the NFS lands included in this bill. However, appropriation of NFS lands by the Corporation would have overall implications for the future of public land management on Prince of Wales Island and in Southeast Alaska and implementation of the Forest Plan.

While the Sealaska land legislation bill may be passed, because of the variable nature of the proposal and a lack of certainty about its passing Congress the effects of harvesting timber on the identified lands were not considered reasonably foreseeable. Nonetheless,

the effects on wildlife associated with the transfer of the parcels identified in S.730 within Biogeographic Province 14 was evaluated as a separate cumulative effects scenario for deer in the Wildlife and Subsistence Resource Report (Woeck 2013) and acknowledged that this may affect the old growth reserve system.

Incomplete and Unavailable Information

Much of the Tongass National Forest resource data resides in an electronic database formatted for a geographic information system (GIS). The Forest uses GIS software to assist in the analyses of these data. GIS data are available in tabular (numerical) and map formats. For this Final EIS, all the maps, and most of the numerical analyses, are based on GIS resource data supported by field inventories.

Further, it should be noted that there is incomplete knowledge about many of the relationships and conditions of wildlife, fish, forests, climate change, jobs, and communities. The ecology, inventory, and management of a large forest area is a complex and developing science. The biology of fish and wildlife species prompts questions about population dynamics and habitat relationships; and the interaction of resource supply, the economy, and communities is the subject matter of an inexact science. However, the basic data and central relationships are sufficiently well-established in the respective sciences for the deciding official to make a reasoned choice between the alternatives, and to adequately assess and disclose the possible adverse environmental consequences.

Other Resources

Several resources and uses of the project area are likely to remain unaffected by the proposed action or alternatives, or will not be affected to a significant degree. Even though significant effects are not anticipated, these resources can be discussed in the sections of this chapter that follow the introduction, to the extent that measurable effects or differences between alternatives are present. Resources or uses for which no measurable effects were identified are discussed briefly here.

Air Quality

No significant effects on global carbon sequestration levels are expected under any of the alternatives considered for the 2008 Forest Plan Final EIS. Therefore, it is reasonable to conclude that small changes (project-level) in carbon sequestration on the Tongass, whether beneficial or adverse, would have a minor effect on atmospheric carbon levels. All of the action alternatives proposed for this timber sale would have limited, short-term effects on ambient air quality. Such effects, in the form of vehicle emissions and dust, are likely to be indistinguishable from other local sources of airborne particulates, including other motor vehicle emissions, dust from road construction and motor vehicle traffic, residential and commercial heating sources, marine traffic, and emissions from burning at sawmills. The action alternatives could result in short-term supplies of raw wood products to local mills. It is the responsibility of the mill owner or sort yard operator to ensure that mill emissions are within legal limits. Air quality is discussed in the Old Growth and Biodiversity Resource Report in the Big Thorne Project record.

Land Status

With the exception of 11,343 acres of State land and 2,826 acres of private land the vast majority (94 percent) of the lands within the project area are owned by the United States and managed by the Forest Service as part of the Tongass National Forest. The non-National Forest lands are near Thorne Bay, Control Lake, and Coffman Cove and were mostly conveyed to the State under the terms of the 1958 Alaska Statehood Act; some of these lands are now in private ownership. These lands, while within the project area, are excluded from the proposed project and alternatives.

There are no project area lands encumbered by unconveyed State selections or by claims filed under the ANCSA or the 1906 Native Allotment Act. The Forest Service has issued recreation special use permits to outfitter-guides and others in the project area.

Sealaska Corporation's final ANCSA entitlements could affect land status when the lands are conveyed. As described above, the current land legislation was introduced into Congress in 2013 to allow Sealaska Corporation to acquire specific NFS lands it has identified, in lieu of selecting lands from its entitlement areas. None of these proposed legislation lands are included in the project area.

Community Profiles

The primary social and economic area of influence for the Big Thorne Project includes those communities located in close proximity to the project area and communities whose residents use the project area for subsistence, recreation, and other activities. It also includes local communities with economic activities that could be affected by the proposed timber sale, primarily wood products operations that could use the timber from the project area and recreation and tourism businesses. The communities that fall into one or more of these categories are Thorne Bay, Coffman Cove, Klawock, Craig, Hollis, Kasaan, and Naukati Bay. Thorne Bay, located within the project area boundary, is the closest community to the project.

Unless otherwise noted, most of the information presented in the following community profiles is from the Alaska Department of Commerce Community and Economic Development's (ADCCED) Alaska Community Database (ADCCED 2011) and the 2008 Forest Plan EIS (USDA Forest Service 2008c).

Thorne Bay

Thorne Bay is located at the head of Thorne Bay on eastern Prince of Wales Island, approximately 40 air miles northwest of Ketchikan. Petroglyphs and other archaeological remains indicate occupation and use of the area by Alaska Natives dating back at least 3,000 years. Post-contact development began in the early 1900s with construction of a saltery on the south shore of Thorne Bay.

Thorne Bay developed as a result of the long-term timber sale contract between the Forest Service and the Ketchikan Pulp Company. In 1960, a floating logging camp was built in Thorne Bay, and, in 1962, a shop, barge terminal, log sort yard, and camp were built to

replace facilities at Hollis. Thorne Bay was incorporated as a second-class city in 1982, making it one of Alaska's newest cities.

Thorne Bay had a total population of 471 in 2010, approximately 86 or 15 percent fewer residents than a decade earlier in 2000 (U.S. Census Bureau 2000, 2011). The population of Thorne Bay is predominantly White (91 percent), with Alaska Natives accounting for 2 percent of the total population (U.S. Census Bureau 2011).

The Thorne Bay economy is primarily based on the timber industry and the Forest Service management of the National Forest. A number of small sawmills are located close to town along the Kasaan Road on the southwest side of Thorne Bay (Goose Creek Industrial Subdivision). In addition, the offices of the Forest Service's Thorne Bay Ranger District are located in town. Other sources of employment in Thorne Bay include recreation and tourism-related activities, including fishing lodges, commercial fishing, and State and local government (Dugan et al. 2009). Thorne Bay is located in the Big Thorne project area and local residents use the area for subsistence and recreation.

Coffman Cove

Coffman Cove is located on northeast Prince of Wales Island. Settlement of Coffman Cove began in 1956 with development of a logging camp. A road connecting Coffman Cove to the larger community of Craig was built in the 1980s. The city was incorporated in 1989.

Coffman Cove had a total population of 176 in 2010, approximately 23 or 12 percent fewer residents than a decade earlier in 2000 (U.S. Census Bureau 2000, 2011). The population of Coffman Cove is predominantly White (93 percent), with Alaska Natives accounting for 4 percent of the total population (U.S. Census Bureau 2011).

Logging support services historically provided the majority of employment in Coffman Cove. One of the major log transfer sites on Prince of Wales Island is located at Coffman Cove. Logging support services still provide some employment, but most employment is now recreation and tourism-based. Tourism facilities include fishing lodges, bed and breakfast inns, apartment/bunkhouse facilities, and rental cabins, as well as fishing day charter operations (Dugan et al. 2009). Commercial fishermen also operate out of the cove and local school system, library, general store, and gas station also provide employment, as well as services to community residents and the north part of the island. Local residents use the area for subsistence and recreation.

Craig

Craig is situated on a small island connected to the west coast of Prince of Wales Island by a causeway and is the largest community on Prince of Wales Island. Tlingit fish camps and seasonal villages originally occupied the present location of Craig. The city is named for its contemporary founder, Craig Miller, who in 1907, with the help of local Haidas, established a saltery at Fish Egg Island. The Forest Service established a permanent ranger station here around 1919. The city of Craig was incorporated in 1922 as a second-class city under the laws of the territory of Alaska and became a first-class city in 1973.

Shaan-Seet Inc. (the village corporation established under the ANCSA) received an interim conveyance of 20,852 acres in 1979 (ADF&G 1994).

Craig had a total population of 1,201 in 2010, approximately 196 or 14 percent fewer residents than a decade earlier in 2000 (U.S. Census Bureau 2000, 2011). Alaska Natives comprise about 19 percent of the local population, with 64 percent of the population identifying as White in the 2010 Census (U.S. Census Bureau 2011).

The Craig economy is primarily based on the fishing and timber industries with commercial fishing, fish processing, logging, sawmill operations, and government and commercial services providing the majority of employment. Craig's increased role as a service and transportation center for the Prince of Wales Island communities has largely been responsible for its growth. Columbia Wards Fisheries, a fish buying station, and a major cold storage plant are located in Craig and 151 residents hold commercial fishing permits. Shan-Seet Village Corporation timber operations is a major employer of local residents. Viking Lumber, the largest sawmill presently operating in Southeast Alaska, is located between Craig and Klawock. There are also a number of fishing lodges in and near town, as well independent operators offering package trips that include guided fishing, meals, and lodging (Cerveny 2005; Dugan et al. 2009).

Hollis

Hollis is located on the east side of Prince of Wales Island on Twelvemile Arm. Initially settled as a mining camp at the turn of the century, Hollis developed into a logging camp in the mid-1950s. In 1960, when Thorne Bay became center of the logging industry on central Prince of Wales Island, most Hollis residents moved to Thorne Bay. In recent years, Hollis has grown as a community, due in part to the State ferry terminal there. Roads now connect Hollis with most other communities on Prince of Wales Island.

Hollis had a total population of 112 in 2010, approximately 27 or 19 percent fewer residents than a decade earlier in 2000 (U.S. Census Bureau 2000, 2011). The population of Hollis is predominantly White (88 percent), with Alaska Natives accounting for 4 percent of the total population (U.S. Census Bureau 2011).

Support services for the timber industry, the Inter-Island Ferry, and the Forest Service provide the majority of employment to the residents of Hollis.

Kasaan

Kasaan is a small village located on the eastern side of Prince of Wales Island. Originally Tlingit territory, Kasaan gets its name from the Tlingit word meaning "pretty town." Haidas migrated north from the Queen Charlotte Islands in the early 1700s to the Island and established the village known as "Old Kasaan." In 1898 the Copper Queen mine, camp, sawmill, post office, and store were built on Kasaan Bay, and the Haida people subsequently relocated to this new site in 1904.

A Federally recognized tribe—the Organized Village of Kasaan—is located in the community. Traditionally a Haida village, the population now includes Tlingits, Eskimos, and non-Natives, as well as Haidas. The community had a total population of 49 in 2010, approximately 10 or 26 percent more residents than a decade earlier in 2000 (U.S. Census

Bureau 2000, 2011). Alaska Natives comprise about 35 percent of the local population, with 53 percent of the population identifying as White in the 2010 Census (U.S. Census Bureau 2011).

The majority of local residents are employed in the public sector. Two residents held commercial fishing permits and most villagers participate in subsistence for food sources, harvesting deer, salmon, halibut, shrimp, and crab. One tourism-related business operates in the village, providing meals and lodging for visitors (Dugan et al. 2009). Local residents use parts of the project area for subsistence and recreation activities.

Klawock

Klawock, located on the west coast of Prince of Wales Island, is the second largest community on the island. The mouth of the Klawock River, where the village of Klawock is now located, has been the site of Tlingit occupation for at least the past 600 years and now serves as the center of the Tlingit population on west Prince of Wales Island. A trading post and salmon saltery were established in the community in 1868, and the first cannery in Alaska was built here by a San Francisco firm in 1878. Klawock was incorporated as a first-class city in 1929.

A Federally recognized tribe—the Klawock Cooperative Association—is located in the community. The community had a total population of 755 in 2010, approximately 99 or 12 percent fewer residents than a decade earlier in 2000 (U.S. Census Bureau 2000, 2011). Alaska Natives comprise about 48 percent of the local population, with 37 percent of the population identifying as White in the 2010 Census (U.S. Census Bureau 2011).

The community has been historically dependent on fishing and cannery operations; however, the timber industry has increased in importance with a relatively large number of residents employed in logging and ship loading in the Klawock and Craig area (ADCCED 2011). As noted above, Viking Lumber is located between Klawock and Craig. A total of 44 residents hold commercial fishing permits.

Retail trade and services are also important to the economy of Klawock. Many residents of communities on northern Prince Wales, as well as recreationists and tourists shop at the shopping center located in Klawock. There are also three sport fishing lodges that provide charter and accommodation packages, as well as an independent operator offering day charters. Klawock also has two recreational vehicle (RV) parks that mostly serve long-term visitors (Dugan et al. 2009).

Naukati Bay

Naukati Bay is located on the northwest coast of Prince of Wales Island. The area was named “Naukatee Nay” in 1904 after the local Native name for the area. The community of Naukati Bay was initially developed as a logging camp, but was later settled as an Alaska Department of Natural Resources land disposal site.

Naukati Bay had a total population of 113 in 2010, approximately 22 or 16 percent fewer residents than a decade earlier in 2000 (U.S. Census Bureau 2000, 2011). The population of Naukati Bay is predominantly White (88 percent), with Alaska Natives accounting for 6 percent of the total population (U.S. Census Bureau 2011).

The Naukati Bay economy is dependent on the timber industry and employment is largely seasonal. Naukati Bay provides log transfer services for several smaller camps on Prince of Wales Island. Three residents held commercial fishing permits in 2010. Local businesses also include a cabin rental business and one sport fish charter operation (Dugan et al. 2009).

Environment and Effects of Significant Issues

The CEQ issues guidance to Federal agencies to determine the significant issues concerning any proposal, and to eliminate those issues that are not significant, or that are outside the scope of this document (40 Code of Federal Regulations [CFR] 1508.27). With the help of the public and other agencies, the IDT identified four issues to be examined in detail for the proposed project. The following sections describe the environmental effects of each of the alternatives as they relate to these four issues. Other resources for which effects may occur are also discussed in this chapter. The environmental effects of timber harvest and road construction on water quality, hydrological function, fish habitat, wildlife habitat, visual quality, soils, wetlands and other resources within the project area are summarized in the sections below, and discussed and analyzed in the specialist reports located in the Big Thorne Project record. All resource reports prepared for this project are incorporated herein by reference.

Issue 1: Timber Supply and Timber Sale Economics

Issue statement: *Timber supply and timber sale economics affect the stability of Southeast Alaska's forest products industry and the ability of the industry to contribute to the local and regional economies.*

The Big Thorne Project is intended to provide enough economic timber to the timber industry to allow for a variety of timber harvest contract sizes and withstand fluctuating market conditions, to the extent possible. This long-term stable and economic timber supply is intended to support local operators and encourage investment in the wood products industry as it begins to transition to young growth harvesting and restoration activities. Timber purchasers and others are concerned about the quantity and quality of timber volume offered by the Forest Service, the cost of road construction, as well as the logging costs associated with the proposed logging systems and silvicultural prescriptions.

Units of Measure

- Timber volume (old-growth and young-growth) by species
- Acres of harvest by logging system and prescription
- Miles of road construction and reconstruction
- Logging and road costs
- Indicated bid value ($ per MBF)
- Number of annualized direct jobs

Analysis Methods

The Logging System and Transportation Analysis (LSTA) for the Big Thorne project area is based on the Forest-wide LSTA completed in 2006. The Forest-wide LSTA was developed using existing information including topographic maps, aerial photographs, and data from past timber sales; it was not field verified. The LSTA for the project area was initially revised by the Forest Service IDT based on their local knowledge of the project area. Field surveys were conducted in 2010 and 2011 to verify and collect information in the project area and harvest units were reviewed for consistency with the 2008 Forest Plan (USDA Forest Service 2008a). The LSTA was subsequently updated to incorporate the findings of these surveys and project review. In addition, in early 2011 all units and roads that entered 2001 IRAs were dropped and revisions were made to incorporate this change, as well as potential changes to small old-growth reserve (OGR) boundaries. This process is discussed further in Chapter 2, under Alternative Development.

The Financial Analysis Spreadsheet Tool - RV (FASTR) version October 31, 2011 (run in April 2013) was used to compare alternatives for the Big Thorne Project. The model was re-run in April 2013 to reflect the changes between Draft EIS and Final EIS in the unit and road designs for all alternatives. On March 28, 2011, FASTR was approved by the Regional Forester to replace the NEPA Economic Analysis Tool Residual Value (NEAT_R) version 2.16 as the Forest Service, Alaska Region, financial efficiency and economic analysis tool for use in timber planning. The FASTR analysis uses the same

logging and manufacturing costs developed for the Alaska Region timber sale appraisal program. Costs reflect production studies and data collected from timber sale purchasers in Southeast Alaska.

The harvest volumes, indicated value, costs, and net stumpage values used in this document are current estimates (run April 2013 and based on FASTR version October 31, 2011). Values and costs derived from FASTR are based on data collected in recent years and represent a snapshot in time. Changes in regional and global timber markets and other factors such as fuel costs can dramatically affect stumpage values and logging costs at the time of implementation and harvest. These estimates are useful primarily for comparing the relative differences among alternatives. FASTR is a tool developed for financial analysis and alternative comparisons. It does not provide an actual sale appraisal. Project economics can vary greatly depending on the quality of timber that is being harvested. FASTR assumes regional averages in regards to stand quality and characteristics and, therefore, may not provide an accurate estimate of the actual stand conditions.

At the time of project implementation, merchantable timber within units and any road right-of-way located on NFS lands will be cruised to determine the quantity, quality, and value of timber for the contract under which that volume of timber is offered. The final sale appraisal would be based on the current appraisal bulletin, current cost information, and a normal profit and risk allowance to determine the minimum advertised stumpage value at the time of offering.

Detailed information about the methodology employed in the following analysis is presented in the Timber Economics Resource Report (Barnhart and Hitner 2013a) prepared for this project.

Affected Environment

The overall analysis area for timber supply and timber sale economics is Southeast Alaska because this is the area that could be potentially affected by changes in timber supply. Southeast Alaska had an estimated population of 74,423 in 2012, with slightly more than two-thirds (67 percent) of that total concentrated in three cities: Juneau, Ketchikan, and Sitka (Alaska DOL 2012a). The remaining population is distributed throughout the region in more than 30 small communities, most with populations of less than 1,000 residents. The communities of Southeast Alaska depend on the Tongass National Forest in various ways, including employment in the wood products, commercial fishing and fish processing, recreation, tourism, and mining and mineral development sectors. Many residents also depend heavily on subsistence hunting and fishing to meet their basic needs. Federal lands comprise about 95 percent of Southeast Alaska, with 80 percent of the region located on the Tongass National Forest. Appropriate management of the forest's natural resources is, therefore, important for local communities and the overall regional economy.

The Big Thorne project area is located on Prince of Wales Island, which has historically played an important role in the region's forest products industry. The population of Prince of Wales Island is distributed among many small communities, most of which are connected by an extensive road system. Communities located in the vicinity of the Big

Thorne project area include Thorne Bay, Coffman Cove, Klawock, Craig, Hollis, Kasaan, and Naukati Bay. Thorne Bay, located within the project area boundary, is the closest community to the project.

Forest Products Industry in Southeast Alaska

The forest products industry has historically been an important part of the economy of Southeast Alaska. Timber employment in Southeast Alaska peaked at the end of the 1980s, with slightly more than 3,500 jobs in 1989 and 1990. Timber employment dropped sharply in the 1990s following closure of the large pulp mills in Sitka (1993) and Ketchikan (1997) and has continued to decline over the past decade, falling from a recent high of 561 jobs in 2003 to 247 jobs in 2010 (Table TSE-1). Tongass National Forest–related employment in logging and sawmilling declined from 199 jobs in 2003 to 109 in 2011, a drop of about 45 percent. Non-Tongass timber employment also declined over this period, falling from a recent high of 362 jobs in 2003 to 153 in 2011, a decrease of 58 percent (Table TSE-1). Sawmill employment has historically been supported by Forest Service timber sales, with a small contribution from State timber harvest. Logging employment is generated from all ownerships, including Native Corporation lands.

Table TSE-1. Timber Industry Employment in Southeast Alaska, 2002–2011

Year[1/]	Tongass Logging[2/]	Tongass Sawmill[2/]	Total Tongass-Related Employment[2/]	Other sawmill	Other Logging	Total Other Timber Employment	Total Industry Employment
2002	63	110	173	40	299	339	512
2003	108	91	199	64	298	362	561
2004	82	95	177	53	220	273	450
2005	88	96	184	52	263	315	499
2006	81	77	158	46	217	263	421
2007	44	70	114	63	225	288	402
2008	52	70	122	24	118	142	265
2009	48	39	87	19	110	129	216
2010	61	46	107	7	133	140	247
2011	62	47	109	3	150	153	262

Notes:
1/ Data are presented by calendar year.
2/ Tongass-related employment estimates are based on the ratio of Tongass timber harvest to total timber harvest in Southeast Alaska.
Source: USDA Forest Service 2012b.

Timber harvest in Southeast Alaska also peaked in the late 1980s, with harvest levels slightly below 1,000 million board feet (MMBF) in 1989 and 1990. Total harvest in 2010 was 112.3 MMBF, about 11.2 percent of peak levels. Harvest on the Tongass accounted for 32 percent (35.4 MMBF) of this total, with 59 percent (66.4 MMBF) of the total provided by Native Corporation lands (Table TSE-2).

Table TSE-2. Timber Harvest in Southeast Alaska by Ownership, 2002–2011

Year	Tongass[1/]	State of Alaska[1/]	Alaska Native Corporations[1/]	Total[1/]
2002	33.8	57.3	101.7	192.8
2003	50.8	34.8	105.7	191.3
2004	46.3	24.2	98.9	169.4
2005	49.5	42.9	103.9	196.3
2006	43.1	44.6	71.2	158.9
2007	18.7	44.6	50.0	113.3
2008	28.0	11.9	52.3	92.2
2009	28.4	13.5	51.8	93.7
2010	35.4	10.5	66.4	112.3
2011	32.6	16.3	63.1	112.0

Note:
1/ Harvest volumes are in million board feet (MMBF). Volumes include both sawlog and utility.
Source: USDA Forest Service 2012b

The wood products industry in Southeast Alaska in its current form consists of individual- and family-owned sawmills and independent logging businesses. The Tongass Sawmill Capacity and Production Report for calendar year 2011 identified 10 active and 3 inactive sawmills in Southeast Alaska, with a total installed production capacity of 160.0 MMBF (Parrent 2012). The mills included in the survey were those assessed in previous survey years. The original list of mills to be surveyed, initially identified in 2001, consisted of the 20 largest and/or most active sawmills at that time. Of these 20 mills (increased to 22 in 2007), 10 were active in 2011, 3 were inactive, and the other 9 had been decommissioned or were no longer in production (Parrent 2012).

Estimated total production for the mills included in the annual mill survey decreased over the past decade from 87.1 MMBF in 2000 to a low of 13.4 MMBF in 2009, a net reduction of 73.7 MMBF or 85 percent. Production increased somewhat between 2009 and 2010, with total estimated production of 15.8 MMBF in 2010 and total production for these mills was estimated to be 11.5 MMBF in 2011. This total (11.5 MMBF) represented 9.9 percent of total active processing capacity in 2011, and 7.2 percent of total active and idle capacity. The Tongass National Forest supplied about 10.8 MMBF or 94 percent of this total, with State lands responsible for most of the remaining 6 percent (Parrent 2012). The Tongass share of timber processed locally (10.8 MMBF) comprised just 34 percent of the total volume harvested (31.6 MMBF) on the Tongass in 2011 (USDA Forest Service 2012b).

Various purchasers had an estimated total of 129.0 MMBF of uncut timber under contract with the Forest Service in February 2013. Alcan Forest Products LLP accounted for 36 percent (46.9 MMBF) of this total, followed by Viking Lumber with 34 percent (44.1 MMBF), Pacific Log & Lumber Ltd with 12 percent (15.0 MMBF), and Icy Straits Lumber & Mill with 7 percent (9.1 MMBF) (USDA Forest Service 2013a). Viking Lumber was the only one of these four purchasers operating a mill in Southeast Alaska in 2011. The Pacific Log & Lumber mill in Ketchikan was idle and the Icy Straits Mill in Hoonah was damaged in a fire in July 2010 (Alexander and Parrent 2012). The Icy Straits Mill is now operating again. Alcan Forest Products, based in Ketchikan, does not operate a processing facility on the Tongass, but must follow the regional export policy, and sell

logs that cannot be exported to a processing facility in the State. Forty-one other purchasers had uncut volume under contract; in all cases but two, the amount under contract was less than 1 MMBF (USDA Forest Service 2013a).

Forest Products Industry – Prince of Wales Island

The timber industry has historically played an important role on Prince of Wales Island. As noted above, regional timber harvest and employment peaked around 1990. At that time, the timber industry accounted for about 470 jobs in the Prince of Wales-Outer Ketchikan Census Area (CA).[1] By 2000, timber employment in the Prince of Wales-Outer Ketchikan CA had declined to 281 jobs, a drop of close to 60 percent (USDA Forest Service 2008b). Timber employment declined by a further 174 jobs (62 percent of the 2000 total) between 2000 and 2010 (Alaska DOL 2011b). In 2011, there were 88 jobs in the forestry and logging sector in the Prince of Wales-Hyder CA, with local sawmills accounting for about 46 jobs (Alaska DOL 2012b; Parrent 2012). Together, these jobs represent about 7 percent of total employment in the Prince of Wales-Hyder CA, down from 15 percent of total jobs in 2000.

There are a number of wood-processing facilities on Prince of Wales Island in or near the Big Thorne project area, including Viking Lumber. In 2011, Viking Lumber accounted for about 61 percent of total sawmill employment in Southeast Alaska, and 87 percent (10.0 MMBF) of the sawlog volume processed, which was equivalent to 12.5 percent of the mill's estimated processing capacity (Parrent 2012).

The number of active mills and timber operators on Prince of Wales Island varies at any given time. Data compiled by the Forest Service and the State of Alaska identified 25 mills and timber operators on the island, including six of the active sawmills and two inactive sawmills identified in the 2011 mill survey (Parrent 2012; Peterson 2012; USDA Forest Service 2012c). In addition, a review of the forestry-related businesses in the Alaska Department of Commerce's business license database identified an additional 19 forestry-related businesses on Prince of Wales Island (ADCCED 2012). The other, smaller mills on the island produce sawtimber, as well as other value-added products. The highest concentration of small mills is in the Goose Creek Industrial Subdivision of Thorne Bay, but there are also operators in Craig, Klawock, Coffman Cove, and Edna Bay.

Six of the 10 active facilities included in the 2011 mill survey are located on Prince of Wales Island, as are two of the three inactive facilities that were included. The active facilities are the Porter Lumber Company, Thuja Plicata Lumber Company, Thorne Bay Wood Products, and Western Gold Cedar Products located in Thorne Bay, St. Nick Forest Products (formerly W.R. Jones and Son Lumber Company) located in Craig, and Viking Lumber. Excluding Viking Lumber, these mills had a combined installed production capacity of 23.1 MMBF and together processed about 1.0 MMBF in 2011, employing

[1] CAs are statistical units that are generally recognized as county equivalents from a data reporting standpoint. Data for 1990 and 2000 are for the Prince of Wales-Outer Ketchikan CA. Parts of this area were annexed in May 2008 by the Ketchikan Gateway Borough and the newly formed Wrangell City and Borough. The remaining area was renamed the Prince of Wales-Hyder CA.

about 12 people in the process (Parrent 2012). The mill survey also identified two inactive mills in Thorne Bay: Northern Star Cedar Products and Thorne Bay Enterprises.

Viking Lumber had an estimated 44.1 MMBF of uncut timber under contract with the Forest Service in February 2013. Other timber operators on Prince of Wales Island had a combined total of 7.3 MMBF of uncut timber under contract with the Forest Service (USDA Forest Service 2013a).

Timber Supply and Market Demand

Detailed explanations of the rationale for considering timber harvest in the Big Thorne project area and market demand for wood products are presented in Appendix A to this document. The 2008 Forest Plan EIS Volume 1 and Appendix G describe the latest timber demand analyses and projections prepared for the Tongass National Forest (USDA Forest Service 2008c).

Factors Affecting Timber Sale Economics

There are many factors that can increase the cost of timber sale offerings and increase the economic risk for potential purchasers. Factors affecting costs include logging systems, harvest methods, silvicultural prescriptions, haul/tow time and distances, and the miles and extent of road construction, reconstruction, and maintenance. The value of the timber for sale must be sufficient to cover this cost and offer a potential for profit to purchasers. Under current Congressional direction (Public Law 112-74, House Report 2055-257, Section 414) no timber sale in the Alaska Region shall be advertised if the indicated rate is deficit. Sales with volumes under 500 MBF currently do not require a residual value appraisal and can be advertised using established standard rates.

The existing road system in the Big Thorne project area allows a large portion of the available timber to be harvested using relatively inexpensive shovel or cable yarding systems without requiring large amounts of new road construction that would offset the economic benefits of using these systems. All of the units in the project area are within 65 road miles of most Prince of Wales Island mills including those in Klawock and the Goose Creek Industrial Subdivision near Thorne Bay. Although individual harvest units may not be economical to harvest by themselves, the management of less-productive land or land containing a higher percentage of defective timber helps to increase future timber yields by removing the defective or diseased trees. This reduces the spread of disease throughout the forest and allows the regeneration of a new rotation of less defective trees that can contribute to a more economic future harvest entry. Harvesting units with higher value along with lower value units can provide more timber volume by allowing the units with lower logging costs to balance those with higher logging costs.

Environmental Consequences

Direct, indirect, and cumulative effects for timber supply and timber sale economics are estimated using quantifiable measures or indicators, as supported by the FASTR financial analysis tool, version October 31, 2011 (run April 2013). Effects are also discussed in qualitative terms, as appropriate.

Timber Volume by Species

Project volume levels affect the Forest Service's ability to offer economically viable timber sales. The volume made available from the project is intended to allow the Forest Service to respond to fluctuating market conditions when packaging timber sales. Also, the larger the timber sale volume, the greater the ability an operator has to respond to market conditions with the volume they have under contract. Larger timber sales occur over a larger geographic area and usually include a range of species and timber products. This allows the operator to focus harvest on the areas that provide the timber products that have higher market demand at that particular time.

Timber volume estimates by species were developed for each harvest unit based on a combination of site-specific and project area stand exam information collected in and around the planned units (Table TSE-3). These volume estimates are based upon basal area plot data collected during the walk-through stand exams along with volume/basal area ratios (V-BAR) developed from existing stand exam data plots located within the project area. These volumes include a breakout of live and dead volume by species, but do not include estimates of the defect or potential product quality of logs. The breakout of live and dead volume by species is included in the silvicultural prescription cards prepared for the project.

Table TSE-3. Timber Volume Estimates by Species and Alternative

	Volume (MMBF)				
Species	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Alt. 4**	**Alt. 5**
Sitka Spruce	0	26.o0	42.2	22.2	28.0
Western Hemlock	0	53.0	76.5	37.8	50.6
Western Red Cedar	0	18.6	26.1	10.0	15.9
Alaska Yellow Cedar	0	7.4	10.0	4.8	6.2
Total Sawlog Volume	**0**	**105.0**	**154.8**	**74.8**	**100.6**
Total Old-growth Sawlog Volume	0	105.0	139.8	62.6	88.6
Total Young-growth Sawlog Volume	0	0.0	15.0	12.3	12.1
Utility Volume	**0**	**16.1**	**20.9**	**9.6**	**13.4**
Total Sawlog and Utility Volume	**0**	**121.1**	**175.7**	**84.4**	**114.1**

Note:
1/ Young-growth sawlog volume is Sitka spruce and western hemlock.

Western hemlock accounts for about half of the total volume under all of the action alternatives, with Sitka spruce ranging from 25 percent (Alternative 2) to 30 percent of total sawlog volume (Alternative 4). Total estimated sawlog volumes range from 74.8 MMBF under Alternative 4 to 154.8 MMBF under Alternative 3. Young-growth ranges from 0 percent (Alternative 2) to 16 percent (Alternative 4) of these total sawlog volumes (Table TSE-3).

The timber volumes proposed for harvest under the action alternatives would help meet the purpose and need for the Big Thorne Project, which is to contribute to a long-term supply of economic timber for the timber industry on Prince of Wales Island and the Tongass National Forest in general (including both large and small operators), in a manner that is consistent with the multiple-use goals and objectives of the Tongass Forest Plan. The purpose and need for the Project is discussed in Chapter 1.

Trees to be maintained in uneven-aged management would represent all species formerly in the stand. Large diameter trees maintained may be of low timber value but of high wildlife value. Smaller diameter trees of good form and vigor, particularly spruce and cedar, would also be maintained. These trees would be left to grow into the next timber crop.

Acres of Harvest by Logging System

All action alternatives propose the use of shovel, cable, and helicopter logging systems for the harvest of the old-growth units. Alternatives 3 through 5 include commercial thinning units using ground-based and cable logging systems. The logging equipment used for old-growth timber is typically not operationally or economically efficient for young-growth commercial thinning operations. Old-growth harvest equipment is designed to handle large log sizes and operate in even-aged harvest units where all the trees are removed. Harvest systems used for thinning need to be suitable for yarding small logs while operating around the trees that will remain. Large cable-yarding systems designed for old-growth harvest are particularly unsuitable for young-growth thinning. Cable-logging systems designed for old-growth harvest generally cannot be moved easily enough to be economically feasible for thinning young-growth.

Although some old-growth logging equipment, such as shovel loaders, may be functionally capable of harvesting young growth, it may not be economically efficient and may result in higher amounts of damage to the remaining trees. Table TSE-4 identifies the number of acres by planned logging system and silvicultural system or intermediate treatment (for young growth).

Table TSE-4. Proposed Logging System and Silvicultural System by Alternative

Harvest System	Alternative (acres)				
	1	2	3	4	5
Old-Growth Logging Systems					
Shovel, Even-aged harvest	0	1,875	2,338	405	1,068
Shovel, Two-aged harvest	0	0	0	292	0
Shovel, Uneven-aged harvest	0	0	0	9	0
Cable, Even-aged harvest	0	1,341	1,763	305	627
Cable, Two-aged harvest	0	0	0	26	0
Helicopter, Even-aged harvest	0	699	836	272	758
Helicopter, Uneven-aged harvest	0	1,205	2,182	3,440	2,999
Helicopter, Two-aged harvest	0	0	0	8	0
Total Old-Growth	**0**	**5,121**	**7,120**	**4,757**	**5,452**
Young-Growth Logging Systems					
Cable, Uniform Thin	0	0	478	355	357
Cable, Strip Thin	0	0	1,131	891	899
Ground-based, Uniform Thin	0	0	691	642	594
Total Young-Growth	**0**	**0**	**2,299**	**1,888**	**1,850**
Total Treated Acres	**0**	**5,121**	**9,419**	**6,645**	**7,302**

Old-Growth Harvest Methods

Shovel and cable are referred to collectively as conventional systems and are generally less costly than helicopter yarding. Conventional systems require adjacent road access and are most efficient using even-aged harvesting methods. Costs increase due to the

extra time and care needed to protect residual trees when uneven-aged silviculture prescriptions are used. In areas that cannot be accessed cost effectively using conventional methods due to high road construction costs or inadequate log suspension, helicopter is the assigned yarding system. Helicopter is also used where resource concerns, such as road density, preclude the use of conventional logging systems. All of these harvest systems are commonly used on Prince of Wales Island.

All of the proposed action alternatives include a mix of even-aged and uneven-aged single tree selection silvicultural prescriptions. In Alternatives 2, 3, and 5, all conventional settings have even-aged silvicultural prescriptions, and the helicopter settings have either even-aged or uneven-aged silvicultural prescriptions. In Alternative 4, the conventional and helicopter settings have even-aged, uneven-aged, and two-aged silvicultural prescriptions. Table TSE-5 shows the increased conventional logging costs with two-aged and uneven-aged prescriptions.

Table TSE-5. Old-growth Stump to Truck Average Logging Costs

Old-growth Logging System	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Shovel Even-Aged Harvest	n/a	$132	$133	$143	$137
Shovel Two-Aged or Uneven-aged Harvest	n/a	n/a	n/a	$178	0
Short-span Cable Even-Aged Harvest	n/a	$259	$261	$289	$273
Short-span Cable Two-Aged or Uneven-aged Harvest	n/a	n/a	n/a	$323	0
Long-span Cable Even-Aged Harvest	n/a	$283	$285	n/a	0
Helicopter All Harvest Prescrioptions	n/a	$377	$403	$366	$385

Silvicultural prescriptions are designed to address resource concerns related to Forest Plan standards and guidelines, as well as other land management objectives including economics. Even-aged management in harvest units proposed for conventional logging allows for lower overall logging and road costs for the volume removed. Uneven-aged management prescriptions allow for certain classes of trees to be maintained to meet resource objectives while harvesting trees with high timber value that are not necessary to meet these objectives. Uneven-aged management using the helicopter logging system allows access to areas that are inaccessible or uneconomical for access by road. Two-aged management allows for more efficient operation of conventional yarding settings than uneven-aged management while meeting other resource objectives.

Single-tree selection would result in a residual stand that is well dispersed across the landscape and generally has the least effect on other resources. A retention amount of either 50 percent of 75 percent of the original stand basal area is used depending on windthrow risk, wildlife objectives, or scenery requirements. This prescription is operationally and economically difficult to implement with conventional harvest systems due to insufficient operating room. Two-age patch clearcuts create small harvest openings up to 5 acres in size and allow enough room for operation of conventional logging systems. A retention amount of 60 percent of the original stand basal area is used with this prescription. Two-aged harvest openings will allow for increased efficiencies in operations likely leading to lower costs than uneven-aged harvests. This will also allow for efficient entry into the stand for future management. When used with two-aged

management, the small openings will need to be connected with trails to access the transportation system.

See the Timber and Vegetation section of this chapter and the corresponding resource report prepared for this project for more information on silvicultural prescriptions.

Shovel yarding is usually the least costly yarding method, as shown in Table TSE-5, and is best suited for gentle terrain (generally slopes less than 25 percent) and yarding distances less than 800 feet. Shovel yarding involves moving logs from stump to landing by repeated swinging of logs by a hydraulic, track-based log loader. Depending on slope and ground conditions, shovel yarding on steeper ground or over longer distances may be possible, but may increase the cost. The well drained and gentle terrain found in much of the project area is well suited for shovel yarding. When used with two-aged patch openings, corridors would be used to allow the equipment to move between openings. The size and distribution of corridors would be dependent on the terrain and road locations.

Cable yarding is best suited for steeper slopes and allows longer yarding distances. This process involves moving logs from stump to landing using a configuration of cables. The logs are transported across the landscape, with one or both ends suspended from cables while they are moved to the landing. This method is limited in that a clear path is required to the landing. Cable yarding costs increase substantially with increased amount of timber retention because the tower must be moved more often and cables need to be pulled in and out of each yarding corridor. Yarding over long distances increases the time it takes the logs to reach the landing and, therefore, also increases the costs. This method is generally more costly than shovel yarding. When used with two-aged patch openings, cable yarding would be conducted using yarding corridors. The distribution and shape of corridors would be dependent on the topography and landing locations. Some lateral yarding may be required to remove trees between yarding corridors.

Helicopter yarding is the most costly yarding method, as shown in Table TSE-5, and is most often used in Southeast Alaska to access harvest units where it is a more cost-effective approach than road construction and conventional yarding. This process involves moving logs, fully suspended, from stump to landing using a helicopter. This yarding method causes the least amount of ground disturbance and reduces the need for new road construction. Although helicopter yarding requires roads to be near enough to allow economic feasibility, it does not require direct access to the units. Yarding distance, turn time (the time it takes the helicopter to make a round trip from the landing to the unit and return), residual canopy closure, and the value of timber yarded influence the economics of helicopter yarding.

Helicopter yarding is the most flexible in the selection of trees to be harvested making it more suitable for uneven-aged harvest prescriptions. Although helicopter yarding costs increase with higher levels of stand retention and crown closure, the increase is not as pronounced as it is for conventional systems, and it can be offset by using harvest prescriptions that expand stand value for all resources by leaving the majority of trees uncut while focusing harvest on trees with the highest timber value and lowest wildlife and other resource values.

Young-Growth Harvest Methods

Two experimental thinning contracts that involved operating in young-growth stands were completed on Prince of Wales Island in 2009 and 2010. Most of the logging equipment and equipment operators used to complete these contracts were brought to Prince of Wales and surrounding islands from the Pacific Northwest and only remained in the area for the duration of the contract. To implement the Big Thorne alternatives that include young-growth commercial thinning (Alternatives 3, 4, and 5), equipment designed for young-growth thinning operations will likely need to be imported into the area. Although old-growth logging equipment may be operationally feasible in some circumstances, it will likely be less economically efficient. A lack of consistent young-growth timber sales has made it difficult to build or maintain an equipment base specialized for operating in young-growth. Young-growth thinning volume provided under the Big Thorne project is expected to help establish an equipment base for operating in young-growth in Southeast Alaska.

The following sections describe the harvest methods that will need to be developed for young-growth thinning in the Big Thorne project area. Young-growth logging costs were calculated using the Region 10 Log Cost Calculator tool using stand exam data from the Prince of Wales Young-growth Feasibility Study (Table TSE-6). Helicopter yarding of young growth was not considered at this time due to the relative high costs. However, it is possible that helicopter yarding could be used in the young-growth units. Helicopter yarding has been used in young-growth management in the Pacific Northwest and, due to similar conditions of the stands and terrain, it may be feasible to use this approach in Southeast Alaska.

Table TSE-6. Young-growth Stump to Truck Average Logging Costs

Young-growth Logging System	Cost per MBF
Ground-based, Uniform Thin	$227
Cable, Uphill Uniform Thin	$450
Cable, Downhill Uniform Thin	$569
Cable, Downhill Strip Thin	$325

Ground-based uniform thinning operations are planned for areas with slopes up to 35 percent with a prescription of a uniform thin. Ground-based young-growth thinning can be conducted on steeper ground than old-growth shovel yarding because the equipment commonly used in young-growth thinning is more suited for steeper terrain. Timber felling will typically be completed using feller-buncher machines or cut-to-length harvesters, although hand felling may be used when necessary. These machines will allow the pre-bunching of logs or trees and the placement of these bunches in an orientation that allows them to be yarded to the road system efficiently in a manner that causes minimal residual stand damage. Yarding equipment options in these areas include small- to medium-size tracked bulldozers, forwarders, clam-bunk skidders, and track-based log loaders.

Due to the low bearing capacity of most soil types in the project area, ground-based thinning may be a less desirable yarding method and may prove to be less cost effective than cable yarding. Forwarders have not been widely used in Southeast Alaska and it is expected that the soil conditions, undulating terrain, and remaining old-growth stumps and

logs may inhibit their use. There are a few units in the Big Thorne project area that have external yarding distances over 800 feet and would, as a result, likely require some form of forwarding equipment.

The uniform thin treatment is being used with a "crown thinning" treatment where most cut trees will consist of poor quality trees from the middle and upper crown. High quality dominant and co-dominant trees will be retained with the exception of trees that need to be removed for yarding corridors and skid trails.

Ground-based thinning is generally the method with the lowest logging cost (see Table TSE-6). The lower cost allows settings that can be harvested with ground-based equipment to improve the overall economics of the project. This equipment does not require straight corridors to operate within, which allows more flexibility to retain high-quality trees that will be of greater future economic value.

Cable uniform thinning operations are planned for all uphill settings with slopes that exceed 25 percent and downhill settings where full suspension can be achieved. Straight yarding corridors that are typically 12 to 15 feet in width will need to be located and marked during implementation. Settings will consist of a combination of parallel corridors that are typically spaced between 150 and 200 feet apart, and corridors that radiate from a single landing with a spacing of approximately 150 to 200 feet at the back end of the units. The specific design would depend upon topography and road location and alignment.

Hand felling methods will likely be required in these units; however, opportunities for mechanical felling will also likely exist, which will increase the efficiency of the yarding operation. Directional felling methods will be critical to the efficiency of these operations. Cable yarding production is significantly increased in units where harvesters are used to fell and pre-bunch logs making it a viable economic option. Multi-span cable systems can also extend the range of operation beyond what can be efficiently yarded with ground-based equipment. Cable yarders will typically be small machines with tower heights between 30 and 55 feet, capable of using intermediate support jacks, with skyline carriages capable of passing over intermediate support jacks and pulling line from the yarder to the choker setters. Appendix B to the Timber Economics Resource Report (Barnhart and Hitner 2013a) prepared for this project is a case study of a cable thinning operation in Oregon that involved thinning stands similar in tree size to what is planned for the Big Thorne project area.

The uniform thin treatment is being used with a "crown thinning" treatment where most cut trees will consist of poor quality trees from the middle and upper crown. High-quality dominant and co-dominant trees will be retained with the exception of trees that need to be removed for yarding corridors and skid trails.

Uniform cable thinning has the highest logging cost of the harvest methods utilized (Table TSE-6). This method is used only in areas where ground-based equipment is not operationally or economically feasible. Although it has a higher logging cost than strip thinning, it is preferred where operationally feasible because uniform cable thinning focuses on removal of poorer-quality trees, which increases the potential future value of the stand. Strip thinning, as noted below, removes all trees within the strips, and therefore

does not have the flexibility to select trees for removal that will increase the future stand value.

Cable systematic "strip" thinning operations are planned for downhill units where full suspension cannot be achieved. Although uniform thinning is the preferred treatment, systematic or strip thinning may be used in some settings to reduce residual tree damage, allow operational feasibility, or reduce treatment costs. The strip thins will harvest a 20- to 60-foot-wide strip of timber and then leave a strip of timber approximately 60 to 120 feet in width (matrix area). The corridor width would depend on operational feasibility, visual concerns, and/or windthrow risk. The matrix area will be thinned where operationally feasible. These strips will preferably be placed perpendicular to the slope and be parallel to each other.

Hand felling will be used for most of these operations; however, opportunities for mechanical felling will also likely exist, which will increase the efficiency of the yarding operation. Cable yarders in these operations will generally need to have at least three drums in order to operate a haulback line to pull the carriage up the corridor to the choker setters. Small- to medium-size towers and swing yarders that are easy to move would be ideal for these operations. Some settings may facilitate the use of high-lead yarding and would, therefore, only require yarders with two drums; however, these systems face operational difficulties with thinning, and are more prone to trees hanging up in other trees. They may be used in occasional situations that allow suspension requirements to be achieved, but they are not expected to be feasible in most settings.

Although cable strip thinning is more expensive than ground-based thinning, it is less expensive than uniform cable thinning. This is due to the fact that strip thinning removes all trees within the strip. Trees in uniform thinning are more dispersed among residual trees and therefore have greater yarding difficulties and costs.

Road Costs

Road construction, reconstruction, and maintenance involve substantial costs, as shown in Table TSE-7, and strongly affect timber sale economics. By using the most cost-effective transportation system while maintaining the appropriate design standards to meet resource requirements, these costs can be reduced. All of the new road construction currently proposed in the action alternatives is designed to provide access to the old-growth units. Access development to young-growth units is currently limited to reconstruction of currently decommissioned roads and the opening of roads currently in storage. These roads cost less to construct than new roads and subsequently improve the economics of young-growth treatments. Decommissioned roads often provide sufficient access to young-growth units because roads were constructed to harvest the previous stand. Although not currently planned, some new construction may be determined to be necessary in these areas during presale implementation.

Road costs for the economic analysis are taken from the Transportation Resource Report (Barnhart and Hitner 2013b) prepared for this project. Construction costs for NFS roads are higher than the costs of building temporary roads. New road construction was designated either as NFS or temporary based on future access needs. Road crossings over

fish streams can add substantial costs at approximately $20,000 per crossing. Average road costs in the project area may be summarized by road construction type as follows:

- § New NFS road construction $175,000/mile
- § NFS road constructed over decommissioned road grade $30,000/mile
- § New temporary road construction $110,000/mile
- § Temporary road construction over decommissioned road grade $20,000/mile
- § Reconstruction of stored NFS roads $30,000/mile
- § Storage and decommissioning of roads $4,000/mile
- § Decommissioning of temporary roads $3,000/mile
- § Additional cost for fish stream crossings (temporary bridges) $20,000/bridge

Table TSE-7 provides a summary of road construction requirements for each alternative. Table TSE-8 shows the resulting road storage and decommissioning cost for each alternative.

Table TSE-7. Proposed Road Construction and Reconstruction by Alternative

Road Construction/ Reconstruction		Alternative				
		1	2	3	4	5
NFS Road Construction	Miles	0	8	14	<1	<1
	Cost	$0	$1,282,000	$2,242,000	$26,000	$86,000
Temporary Road Construction	Miles	0	24	38	11	16
	Cost	$0	$2,321,000	$3,160,000	$555,000	$1,068,000
NFS Stored Road Reconstruction	Miles	0	18	37	19	18
	Cost	$0	$1,284,000	$2,482,000	$1,120,000	$826,000
Total	**Miles**	**0**	**50**	**89**	**31**	**34**
	Cost	**$0**	**$4,887,000**	**$7,884,000**	**$1,701,000**	**$1,980,000**

Note:
1/ The estimated totals include the costs for fish stream crossings (temporary bridges).

Table TSE-8. Road Storage and Decommissioning Costs by Alternative

Storage/Decommissioning	Alternative				
	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Storage of NFS Roads After Use	$0	$106,000	$202,000	$78,000	$73,000
Decommission Temporary Roads	$0	$95,000	$150,000	$45,000	$63,000
Total Storage and Decommissioning	**$0**	**$201,000**	**$352,000**	**$123,000**	**$136,000**

Haul Costs

Haul costs used in the analysis presented in this document are based on round-trip truck haul to Viking Lumber near Klawock for all Phase 1 harvest units and truck haul to the Goose Creek Industrial Subdivision (near Thorne Bay) for all Phase 2 harvest units. These locations were used in the analysis as the appraisal point in accordance with direction in FSH 2409.18, Section 45.11. An appraisal point is based on the location where the products can be sold and is the most advantageous for the total transportation costs. Phase 2 harvest units would likely be offered as small sales that could be purchased by smaller operators located at the Goose Creek Industrial Subdivision and elsewhere. The Goose

Creek Industrial Subdivision is closer to the project area than the mill at Klawock and, therefore, the haul costs are less. Transporting logs by raft or barge to a mill off the Prince of Wales Island road system would incur additional expense. Truck haul to the Coffman Marine Access Facility (MAF) and Thorne Bay MAF, with water tow costs to mills in other locations was considered. However, with the improved highways on Prince of Wales Island, preliminary analysis showed the total costs to be higher for all harvest units in all alternatives. Average costs for haul to the Coffman and Thorne Bay MAFs are lower than those for haul to Klawock for some settings; however, barging and rafting costs would be incurred from Coffman Cove and Thorne Bay and would more than offset the savings in trucking. Assumed average travel speeds for each road class are identified in Table TSE-9.

Table TSE-9. Average Truck Speeds Used for Analysis

Road Class	Avg. Travel Speed (mph)
Highway	38
Arterial	22.5
Collector	15
Local	11
Temporary	9

Pond Log Values

Pond log values are the price a buyer would pay for a log at the mill site (selling value minus manufacturing costs). These values depend primarily on species and log quality and are strongly affected by regional and global fluctuations in markets. The FASTR financial analysis tool has very limited log quality inputs and relies primarily on regional averages. Actual log quality may deviate from the regional averages and cause variations in the log values. There are some measures that can be taken, such as single tree selection, to increase average pond log values at implementation and create more economically viable timber sale offerings. Trees that currently have less economic value but have potential for higher future values can be retained to allow economically feasible future entries. This could be most effectively applied to helicopter settings because the retention trees pose operational difficulties to equipment trying to operate within the stand. A contract provision for optional removal of utility wood can also increase overall values by allowing the operator to leave utility wood in the harvest unit even though the purchaser must pay for the wood. FASTR-generated estimates of average pond log values are presented for each alternative in Table TSE-10.

Table TSE-10. Pond Log Values by Species and Alternative

	Alternative				
Pond Log Value $/MBF	**1**	**2**	**3**	**4**	**5**
Sitka Spruce	$0	$862	$812	$784	$801
Western Hemlock	$0	$407	$391	$373	$383
Western Redcedar	$0	$303	$303	$303	$303
Alaska Yellow-Cedar	$0	$680	$680	$680	$680
Weighted Average Pond Log Value	$0	$520	$509	$505	$505

FASTR-generated log values vary between alternatives depending on the composition of young growth and the amount of volume going to domestic or export markets. FASTR assumes that all western redcedar is processed domestically and that all Alaska yellow-

cedar is sent to markets outside of Alaska. Therefore, the assumed pond log values for these species do not change among alternatives. All young-growth timber is appraised for export. The volume of export versus domestic processing is adjusted for the FASTR program until the volume appraised for export is equal to 50 percent as explained in the Limited Export Shipment Policy section below. The pond log values for these species vary by alternative, as shown in Table TSE-10, depending on these adjustments. More accurate log values would be used at the time of appraisal based on the cruise information for the project area, which units are in the sale, silvicultural prescriptions, and logging systems.

R10 Limited Export Shipment Policy

In March 2007, the Regional Forester approved the limited interstate shipment policy, which allowed certain unprocessed spruce and hemlock logs to be appraised for shipment to the Lower 48 states. This policy was expanded to allow foreign export in 2008 for existing contracts if a premium was paid for certain species. The policy was expanded in November 2009 for all contracts. At that time, a foreign market appraisal was established for use on timber sales to reflect export values for spruce and hemlock (USDA Forest Service 2011a). The 2009 policy allows export of 50 percent of total sawlog volume applied to spruce and hemlock logs. Western redcedar and Alaska yellow-cedar may also be exported.

The limited export policy enhances opportunities for local supply to manufacturers who depend on Tongass timber by increasing the probability that sales will appraise positive as required by Public Law 112-74, House Report 2055-257, Section 414. Appropriations language preventing the offer of deficit timber sales in the Alaska Region has been carried forward in fiscal year 2013 through a continuing resolution.

The limited export policy is reviewed on an annual basis. An April 2012 briefing paper stated that given current economic conditions, specifically, the housing market slump and low wood products prices, the limited export policy will likely be needed for at least 2 more years. The Regional Forester noted in the 2013 review that, while slight improvements occurred nationally in 2012, challenges continue for purchasers seeking domestic markets for Alaska timber. As a result of this review, the limited export policy will remain in place for calendar year 2013 (USDA Forest Service 2013b).

Opportunities for Small Sales

The project area's geographic location places it within easy reach of most of the existing small mills on Prince of Wales Island. These mills typically rely on nearby, road-accessible timber for their wood supply and, individually, tend to process less than 1 MMBF a year. This was the case with estimated volumes processed by the small mills in Thorne Bay included in the 2010 mill survey, with annual volumes ranging from 30 MBF (Porter Lumber Co.) to 600 MBF (Thorne Bay Wood Products) (Alexander and Parrent 2012). Small timber sales generally require lower variable logging costs to be economically viable because fixed costs are distributed over a smaller volume of timber. Costs associated with transporting timber are reduced in cases where timber is road-accessible and involves shorter hauls to local mills.

Each action alternative includes harvest units of suitable size, design, and species composition for timber sale offerings of less than 1 MMBF. The extent of these opportunities for each alternative is strongly correlated to the total harvest acres and, more specifically, to those acres proposed for harvest using conventional logging systems. The timber volume in any of the action alternatives could be administratively separated into several smaller sales.

Timber Sale Program Adaptive Management Strategy

The Forest Plan ROD defined a Timber Sale Program Adaptive Management Strategy that restricts timber sales and associated road construction to a specified portion, or phase, of the allowable sale quantity (ASQ) land base until actual timber harvest indicates the need for a larger land base (USDA Forest Service 2008c). This strategy divided the ASQ land base into three phases (Phases 1 through 3). The Forest is currently offering timber sales on lands designated as Phase 1 under the Adaptive Management Strategy. Timber from lands designated as Phase 2 under the Adaptive Management Strategy cannot be offered for sale until the total harvest of timber on the Tongass exceeds 100 MMBF for two consecutive years. At this time, timber from these lands can be offered as microsales[1] , salvage sales, or small sales less than 1 MMBF, which could potentially benefit the small mills on Prince of Wales Island.

The Big Thorne project area includes three VCUs that are designated Phase 2; units in the Big Thorne alternatives are in two of these VCUs. These units are included to be offered for sale at this time as small sales less the 1 MMBF to benefit the small mills on Prince of Wales Island. The proposed acres and volumes in Phase 2 lands by alternative are displayed in Table TSE-11. Phase 2 harvest units include only old growth timber. The number of Phase 2 units ranges from 17 under Alternatives 4 and 5 to 33 under Alternative 3 (Table TSE-11).

Table TSE-11. Proposed Harvest Acres and Volumes in Phase 2 Lands

Acres/Volume	Alternative				
	1	2	3	4	5
Number of Phase 2 Harvest Units	0	22	33	17	17
Phase 2 Harvest Acres	0	745	1,014	600	681
Percent of Total Acres[1/]	0	15%	11%	9%	9%
Sitka spruce (MMBF)	0	1.5	3.3	0.6	1.4
Western hemlock (MMBF)	0	8.6	10.9	3.3	6.6
Yellow cedar (MMBF)	0	0.1	1.0	0.0	0.1
Western redcedar (MMBF)	0	6.4	7.6	2.4	5.1
Total Phase 2 Harvest (MMBF)	0	16.6	22.7	6.3	13.1
Percent of Total Harvest Volume[2/]	0	16%	15%	8%	13%

Notes:
1/ Total acres are presented by alternative in Table TSE-4.
2/ Total estimated harvest volumes are presented by alternative in Table TSE-3.

Phase 2 lands range from 9 percent of total proposed harvest acres under Alternatives 4 and 5 to 15 percent under Alternative 2. As a share of total estimated harvest, Phase 2 lands range from 8 percent under Alternative 4 to about 16 percent under Alternative 2 (Table TSE-11).

Timber Economics Alternative Comparison

The FASTR model was used to provide an indication of bid value for each of the action alternatives. As currently allowed under the limited shipping policy, a mix of foreign and Alaska markets were used to perform the financial analysis for each alternative (USDA Forest Service 2011a). All yellow-cedar and young-growth thinning timber (western hemlock and Sitka spruce) were appraised to export markets. All western redcedar and old-growth Sitka spruce timber volume was appraised to Alaska markets. Different levels of old-growth western hemlock volume (ranging from 1 to 18 percent) were appraised to Alaska markets with the remainder being appraised to foreign markets, depending on the alternative. The level of old-growth western hemlock appraised to foreign markets was adjusted to achieve the maximum percent of foreign export volume for each alternative allowed under the current limited shipping policy.

Overall, young-growth thinning had an adverse effect on the economics of Alternatives 3, 4, and 5. This was due to the higher logging costs, and lower overall pond log values achieved by young-growth. Although the young-growth thinning on its own would have resulted in negative indicated bid values, positive values were achieved in Alternatives 3 and 5 due to the better economics of old-growth harvest.

When a timber sale is prepared for sale, the Alaska region appraises the sale using the Residual Value method to arrive at fair market value for timber sold. Revenues (final product selling values) used in the Residual Value appraisal are determined from a sample of timber purchasers' records. Revenues are brought back to Alaska mills (subtracting freight from point of sale) and are converted to log scale ($/MBF). Operational cost or the cost of logging and transportation ($/MBF) are subtracted to estimate value on the stump. An amount for normal profit and risk is subtracted to determine the stumpage value. The remainder is the indicated advertised rate or amount per MBF the Forest Service thinks that a purchaser with average costs and markets can pay for the project volume, while still maintaining profitability.

The FASTR model uses current revenues and costs, estimates of volume and regional averages to derive an estimate of value for comparison of alternatives. Estimates are presented by alternative in Table TSE-12. These values are current estimates and useful for comparing relative differences between alternatives. Values at the time the timber sale is offered may be different, depending on markets, configuration of the sale, and cruised volume. Under current Congressional direction (Public Law 112-74, House Report 2055-257, Section 414) no timber sale in the Alaska Region shall be advertised if the indicated rate is deficit. Stumpage rates must be at least the established minimum rates for any timber of merchantable size and quality (FSM 2431.31b). Under current estimates of volume and value, Alternative 4 currently appraised at a deficit and could not be offered. Parts of this alternative could be redesigned into a more positive offer. In addition, as noted, while these values are suitable for a comparison of alternatives, actual values will not be determined until the time of sale, and will be based on cruised volume and values based on current market conditions at that time.

Table TSE-12. Costs and Values by Alternative

Cost Types	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Average Pond Log Value Weighted by Species ($/MBF)[1/]	$0	$520	$509	$505	$505
Stump to Truck Cost ($/MBF)[2/]	$0	$240	$264	$318	$303
Haul Cost ($/MBF)[3/]	$0	$47	$51	$51	$49
Road Construction/Maintenance ($/MBF)[4/]	$0	$55	$60	$33	$29
Profit & Risk Margin ($/MBF)	$0	$115	$113	$112	$112
Indicated Bid Value ($/MBF)[5/]	$0	$58.41	$17.01	($13.35)	$6.75
Total Indicated Bid Value	**$0**	**$6,130,787**	**$2,633,034**	**($998,866)**	**$679,628**

1/ Pond Log Value: Final product (lumber) values minus production costs (milling) or what a mill of average efficiency can pay for delivered logs
2/ Stump to Truck Cost: The harvesting costs for an operator of average efficiency
3/ Haul Cost: Cost of round-trip truck transport to Klawock or Goose Creek, based on weighted average distance and speed
4/ Road Cost: Estimated average cost of new road construction, existing road reconstruction, and maintenance
5/ Indicated Advertised Value: Pond Log Value minus stump to mill costs and other associated costs (camp, lodging, P&R margin, etc.)

Projected Employment and Income

In accordance with the purpose and need for the proposed action, the action alternatives would contribute to a long-term supply of timber for the wood products industry in Southeast Alaska. The action alternatives would harvest old-growth timber from approximately 4,800 to 7,100 acres and Alternatives 3 through 5 would commercially thin young-growth forest on 1,900 to 2,300 acres using various sizes of timber sales (Table TSE-4). There would be no commercial thinning under Alternative 2. The sawlog volumes available under the action alternatives (ranging from 84 to 176 MMBF) would be used to offer economically viable timber sales and would be adjusted to reflect changing market conditions as needed. Timber harvest would support direct jobs in the wood products industry, as well as indirect jobs in other local and regional economic sectors.

Direct employment and income estimates are presented as a range in Table TSE-13. These estimates are for employment that would take place in Southeast Alaska. Although estimates of value for timber in the various alternatives are based on maximizing shipment out of state of timber sold in the plan area, purchasers have the choice to sell as much as they can to other markets as allowed under the limited export policy, or process part or all of the material in local sawmills. Actual employment and income in Southeast Alaska would depend on choices made by purchasers; those choices may change as markets and prices shift. Under current market conditions, purchasers are likely to export as much as they can while processing enough material locally to keep manufacturing facilities open, and take advantage of opportunities to produce high value sawn material in Southeast Alaska.

Jobs are presented in Table TSE-13 as "annualized" job-years. Annualized jobs are employment estimates adjusted to be based on a full year even though the employment may be seasonal. The resulting employment estimates would not all occur in one year and estimated job-years do not directly translate into numbers of affected workers. The job and income estimates presented in Table TSE-13 are approximate numbers based on average jobs per MMBF ratios that were estimated using harvest and employment data

from 2007 to 2010. These numbers allow a comparison of the different alternatives based on total volume harvested. Actual numbers would vary under each alternative as timber offerings are packaged to include some or all of the units, and individual sales targeted for different sized operators are developed.

Table TSE-13. Estimated Timber Volume, Employment, and Income by Alternative

Volume/Jobs/Income	Alternative				
	1	2	3	4	5
Total Sawlog Volume (MMBF)	0	105.0	154.8	74.8	100.6
Utility Volume (MMBF)	0	16.1	20.9	9.6	13.4
Jobs Related to Logging[1/]	0	237	350	169	227
Jobs Related to Sawmilling[1/2/]	0	121-261	181-348	87-155	118-221
Jobs Related to Transportation and Other Services[1/2/3/]	0	72-120	119-175	62-85	79-114
Total Direct Jobs[1/2/]	**0**	**478-570**	**706-816**	**341-386**	**459-527**
Direct Income ($ million)[4/]	0	25.1-26.9	37.0-39.1	17.9-18.8	24.1-25.4

Notes:
1/ Employment and income by alternative are estimated by the FASTR model based on employment coefficients from 2007 to 2010 (Alexander 2012).
2/ Local sawmilling and transportation-related employment estimates are based on a range, from maximum possible shipment out of state (export of all Alaska yellow-cedar plus hemlock and Sitka spruce export equal to 50% of total sale net sawlog volume), to no shipment of hemlock and Sitka spruce and export of 100% Alaska yellow-cedar and 100% young growth. Young growth is appraised as 100% export because Southeast Alaska has not yet established a feasible market for sawn young growth.
3/ Transportation and other services include water transportation, independent trucking, stevedoring, scaling, and export marking and sort yard employment for export volume, and water transportation, scaling, and independent trucking for locally sawn volume. Export employs more workers in transportation and other services per MMBF harvested than domestic production. This is reflected in the range of values presented above.
4/ Sawmill and transportation-related income estimates are based on the same assumptions as employment and are presented as a range.

Indirect employment effects are not estimated in Table TSE-13 because, while indirect employment coefficients can be estimated and are applicable at large scales, such as regional or statewide assessments, they are less useful at small local scales and can in fact be misleading. Indirect effects include jobs and income associated with industries that supply inputs to the harvest and processing sectors, as well as those supported by spending elsewhere in the local economy.

Forest Service Costs

Forest Service Financial Efficiency Analysis as required by FSH 2409.18 compares estimated Forest Service direct expenditures with estimated financial revenues. Estimates are presented for sale preparation, sale administration, and engineering support costs in Table TSE-14, using average costs per MBF calculated based on a "snapshot" review of fiscal years 2010, 2011, and 2012 (Vermillion 2012). Sale preparation costs include unit layout, cruising, appraisal, and contract development. Sale administration consists of administering the timber sale contract from the time the sale is awarded until the sale is completed. Engineering support consists of planning and timber sale contract administration activities associated with new facility and road construction, use of existing facilities and road maintenance.

The cost estimates presented below are, as noted, based on average costs per MBF. There are a number of factors that could cause actual costs to be higher or lower than regional

averages. Sale preparation costs increase when implementing uneven-aged harvest units, as compared to even-aged harvest units. Implementation and administration of several small sales could cost more than one or two large sales. Accessibility to the units is another major cost factor. The numbers presented in Table TSE-14 are useful to compare relative differences among alternatives.

Table TSE-14. Estimated Forest Service Financial Costs and Revenues by Alternative

Forest Service Costs[1/]	Alternative				
	1	2	3	4	5
Sale Preparation	$0	$2,181,151	$3,216,702	$1,554,721	$2,091,078
Sale Administration	$0	$1,278,461	$1,885,440	$911,285	$1,225,666
Engineering Support	$0	$2,379,533	$3,509,271	$1,696,127	$2,281,268
Total Financial Costs	$0	**$5,839,145**	**$8,611,413**	**$4,162,133**	**$5,598,011**
Indicated Advertised Rate	**$0**	**$6,130,787**	**$2,633,034**	**($998,866)**	**$679,628**
Net Value[2/]	$0	**$291,642**	**($5,978,379)**	**($5,160,999)**	**($4,918,383)**

1/ Based on Alaska Region's average budget allocation for cost centers. These costs are as follows: Sale Preparation $21/MBF; Sale Administration $12/MBF, and Engineering Support $23/MBF (Vermillion 2012).
2/ Indicated bid value minus total project costs.

In addition to the costs identified in Table TSE-14, the Forest Service also incurs environmental analysis and documentation costs including field inventory, data analysis, public involvement, and preparation of documents that satisfy the requirements of NEPA. These costs are not included in Table TSE-14 because they are considered sunk costs that apply across all alternatives, including the no action alternative. An average cost of $48/MBF for environmental analysis and documentation was used to determine feasibility at the project proposal stage. The total cost for this project calculated for Alternative 2 was estimated to be $2.5 million.

The above financial efficiency analysis compares those costs and benefits for each alternative that can be quantified in terms of actual dollars spent or received in the project area. This type of analysis does not account for non-market benefits, opportunity costs, individual values, or other values, benefits, and costs that are not easily quantifiable. This is not to imply that such values are not significant or important, but to recognize that non-market values are difficult to represent by appropriate dollar figures. Financial efficiency should not be viewed as a complete answer but as one tool decision-makers can use to gain information about resources, alternatives, and trade-offs between costs and benefits.

Alternative 1 – No Action

Direct and Indirect Effects

Under this alternative, there would be no timber volume available for sale through the Big Thorne Project. The project would not meet the purpose and need, which is to contribute to a supply of economic timber industry on Prince of Wales Island and on the Tongass National Forest in general (including both large and small operators), in a manner that is consistent with the multiple-use goals and objectives of the Tongass Forest Plan. The Big Thorne Project is intended to provide a supply of economic timber. In order to meet this objective, the project is designed to include sufficient units and volume to allow the Forest Service to adjust future timber sale offerings from the project area to meet fluctuating market conditions, to the extent possible. A stable and economic timber supply is

intended to support local operators and encourage investment in the wood products industry as it transitions to include more young growth harvesting and restoration activities.

This alternative would not support any direct annualized jobs (Table TSE-13). There would be no estimated Forest Service financial costs or revenues under this alternative (Table TSE-14). However, as noted above, the Forest Service has incurred sunk costs related to satisfying the requirements of NEPA that apply to all the alternatives including No Action.

Cumulative Effects

Past timber sales have contributed to the development of the existing roaded infrastructure that would be used for each action alternative. Timber harvest has been conducted in the Big Thorne project area for more than 70 years. Industrial-scale logging activity began in the 1960s. More detailed information on past harvest in the project area is provided in the Catalog of Events in Appendix D of this EIS.

Under Alternative 1, timber operators on Prince of Wales Island and elsewhere in Southeast Alaska would not be able to bid on future timber offerings made available through the Big Thorne Project, and would need to obtain timber for processing from other sources, as available. Other potential sources of timber in Southeast Alaska include timber that will be made available through other timber sales on the Tongass National Forest and timber from other lands, primarily State of Alaska and Native Corporation lands, as well as existing timber sales already under contract. Sawmill employment in Southeast Alaska has historically been supported by Forest Service timber sales, with a small contribution from State timber harvest (USDA Forest Service 2012b).

Recent and reasonably foreseeable timber management projects identified for the cumulative effects analysis are summarized in Appendix D, Part II of this EIS. These include projects located within and near the Big Thorne project area. Identified projects on NFS lands are included in the volume under contract discussed in the preceding paragraph or involve limited volume, such as the Roadside Micro Timber Sales (Appendix D). State timber harvest projects in the Big Thorne project area include an estimated 635 acres of harvest and approximately 19 MMBF of volume. Other reasonably foreseeable projects on State lands on Prince of Wales and surrounding islands involve an estimated 2,700 acres, including 840 acres on Kosciusko Island (440 acres old-growth; 400 acres young growth). Using an average of 1 MMBF/40 acres, this could result in a further 67 MMBF being available to purchase on State lands in the future.

The Big Thorne Project is an important component of the Forest Service's plan to meet the goals of the Forest Plan and provide an orderly flow of timber to local industry. The reasons why the Big Thorne project area was selected are discussed in Appendix A and include the well-developed road system within the project area and its proximity to a substantial infrastructure of existing saw mills, which included two-thirds of the existing processing capacity identified in the most recent mill capacity survey (Parrent 2012).

Other Forest Service projects on the Tongass that include more than 20 MMBF for commercial harvest and were as far or further along in the planning process than the Big Thorne Project when the Draft EIS was prepared for this project included the Tonka and

Kuiu Timber Sale projects. The Tonka Timber Sale project is now part of an integrated resource timber contract that was awarded on September 24, 2012, and included 36.4 MMBF of timber.

In the absence of a multiple-year stable supply of economic timber from the Big Thorne Project or elsewhere, the future viability of existing mill operators could be negatively affected. Closure of one or more mills could result in a further reduction in jobs in the logging and sawmilling industries and could also affect local businesses that provide goods and services to these industries.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Alternative 2 has the highest estimated pond log value of any alternative ($520/MBF) because it includes only old-growth units and also has the lowest estimated logging costs ($240/MBF), which are achieved by utilizing more conventional logging systems than helicopter logging (Table TSE-12). In addition, only even-aged management prescriptions are used with conventional systems under this alternative, which further reduces the logging cost. This alternative has the lowest estimated haul costs ($47/MBF) because a large portion of the units in this alternative are located near Klawock.[2]

This alternative has the second highest estimated road costs per MBF harvested of the action alternative ($55/MBF). Fewer roads would be built under this alternative than under Alternative 3, but the total volume harvested would be lower resulting in lower but relatively similar costs per MBF ($55/MBF versus $60/MBF) (Table TSE-12).

Overall, Alternative 2 achieves the highest total indicated advertised value of any alternative at $58.41/MBF (Table TSE-12). It utilizes low cost logging systems and has the highest log values. It does not treat any young-growth stands and subsequently treats the fewest total acres of any action alternative (Table TSE-4).

Under Alternative 2, a total of 121.1 MMBF of sawlog and utility volume would be available for harvest (Table TSE-3). Assuming all units and volume were harvested, this alternative would support an estimated 237 logging jobs and 121 to 261 jobs in the sawmill sector, as well as 72 to 120 jobs related to transportation. These jobs would generate an estimated $25.1 million to $26.9 million in direct income (Table TSE-13). This employment would not all occur in one year and estimated job-years do not directly translate into numbers of affected workers.

The indicated advertised rate estimated for the entire sale volume under this alternative ($6,130,787) would exceed the total Forest Service financial costs ($5,839,145), excluding costs for environmental analysis, resulting in an overall net positive value of $291,642 (Table TSE-14).

[2] The logging costs used in the analysis summarized in this document are based on truck haul to Klawock for all Phase I harvest units. Costs for all Phase 2 harvest units are based on truck haul to Goose Creek (near Thorne Bay).

Cumulative Effects

Timber harvest under this alternative and other reasonably foreseeable projects on the 5-year plan would contribute to meeting projected market demand for timber in Southeast Alaska and support logging and sawmill or export jobs. Reasonably foreseeable projects are on the 5-year plan which is periodically updated to add projects. Timber projects listed in Appendix D, Part II and discussed under Alternative 1 would also contribute to the timber supply. Compared to the other action alternatives, Alternative 2 would contribute the third highest volume (less than Alternatives 3 and 5, more than Alternative 4) and has the highest indicated bid rate.

Alternative 3

Direct and Indirect Effects

This alternative has an estimated pond log value of $509/MBF, lower than Alternative 2 and higher than Alternatives 4 and 5 (Table TSE-12). Alternative 3 has the largest volume of western redcedar volume, which has the lowest pond log value. This causes a decrease in the average pond log value and negatively affects the economics of the alternative.

The estimated logging cost for this alternative is $264/MBF, which is higher than the estimated cost for Alternative 2 at $240/MBF, but substantially lower than for Alternatives 4 and 5 at $318 and $303, respectively (Table TSE-12). Estimated logging costs are higher than those under Alternative 2 because this alternative includes young-growth thinning units. Thinning has a higher associated cost than even-aged harvesting. This alternative also includes a small amount of conventional old-growth logging settings assigned an uneven-aged management prescription. Conventional logging costs increase when operating in an uneven-aged prescription, as shown in Table TSE-5.

Alternative 3 has the joint highest estimated haul costs ($51/MBF) along with Alternative 4 (Table TSE-12). Hauling costs are higher than under Alternative 2 because more units are located farther to the north of Klawock resulting in longer average haul distances. This alternative has the highest total estimated road costs ($60/MBF) of any action alternative because substantially more roads would be built under this alternative, with roads being built to access smaller or low volume units (Table TSE-12).

Alternative 3 has the second highest estimated indicated advertised value at $17.01/MBF, less than half the highest value ($58.41/MBF), which is estimated under Alternative 2 (Table TSE-12). Although it has a lower estimated pond log value and higher average logging cost than Alternative 2, this alternative treats the largest amount of acres. It also includes young-growth thinning units, which could increase future timber values.

Under Alternative 3, a total of 175.7 MMBF of sawlog and utility volume would be available for harvest (Table TSE-3). Assuming all units and volume were harvested, this alternative would support an estimated 350 logging jobs and 181 to 348 jobs in the sawmill sector, as well as 119 to 175 jobs related to transportation. These jobs would generate an estimated $37.0 million to $39.1 million in direct income (Table TSE-13). This employment would not all occur in one year and estimated job-years do not directly translate into numbers of affected workers.

Alternative 3 would treat more total acres (old growth and young growth) than the other action alternatives (Alternatives 2, 4, and 5), ranging from 1.3 times (Alternative 5) to 1.8 times as many (Alternative 2) and generate sawlog volumes that range from 1.3 times (Alternative 5) to 2.2 times as many (Alternative 4) as the other action alternatives. These higher volumes are reflected in the job and income estimates, which are based on average jobs/MMBF ratios (Table TSE-13).

Total Forest Service financial costs, excluding costs for environmental analysis, would exceed the indicated advertised rate estimated for the entire sale volume under this alternative by approximately $6.0 million (Table TSE-14).

Cumulative Effects

Timber harvest under this alternative and other reasonably foreseeable projects on the 5-year plan would contribute to meeting projected market demand for timber in Southeast Alaska and support logging and sawmill or export jobs. Reasonably foreseeable projects are on the 5-year plan which is periodically updated to add projects. Timber projects listed in Appendix C, Part II and discussed under Alternative 1 would also contribute to the timber supply. Compared to the other action alternatives, Alternative 3 would contribute the highest volume and has the second highest indicated bid rate.

Alternative 4

Direct and Indirect Effects

This alternative has the joint lowest estimated pond log value ($505/MBF) along with Alternative 5 (Table TSE-12). This is primarily because young-growth thinning comprises a larger share of total harvest than under any of the other alternatives.

Alternative 4 has the highest logging costs ($318/MBF). This alternative includes a high number of helicopter logging units, which have higher logging costs. Alternative 4 also includes a large amount of two-aged management prescribed in shovel and cable logging units. This prescription is more difficult to implement for conventional logging systems than even-aged management, and subsequently has a higher cost.

Along with Alternative 3, this alternative has the joint highest estimated haul costs ($51/MBF). Haul costs are relatively high because a higher percentage of units being harvested are in the northern part of the project area, resulting in a longer average haul distance to Klawock.

The road costs for Alternative 4 ($33/MBF) are lower than under Alternatives 2 and 3 because this alternative includes more helicopter logging. Helicopter logging systems typically require less road construction and timber can often be flown to the nearest existing roads.

Alternative 4 has the lowest indicated advertised value of any action alternative. It is the only alternative to have a negative estimated value (-$13.35/MBF) (Table TSE-12). Based on this value, this alternative would not be saleable at this time. Parts of this alternative could be redesigned into a positive offer.

Under Alternative 4, a total of 84.4 MMBF of sawlog and utility volume would be available for harvest (Table TSE-3). Assuming all units and volume were harvested, this alternative would support an estimated 169 logging jobs and 87 to 155 jobs in the sawmill sector, as well as 62 to 85 jobs related to transportation. These jobs would generate an estimated $17.9 million to $18.8 million in direct income (Table TSE-13). This employment would not all occur in one year and estimated job-years do not directly translate into numbers of affected workers.

Total Forest Service financial costs, excluding costs for environmental analysis, would exceed the indicated advertised rate estimated for the entire sale volume under this alternative by approximately $5.2 million (Table TSE-14).

Cumulative Effects

Timber harvest under this alternative and other reasonably foreseeable projects on the 5-year plan would contribute to meeting projected market demand for timber in Southeast Alaska and support logging and sawmill or export jobs. Reasonably foreseeable projects are on the 5-year plan which is periodically updated to add projects. Timber projects listed in Appendix D, Part II and discussed under Alternative 1 would also contribute to the timber supply. Compared to the other action alternatives, Alternative 4 would contribute the lowest amount of volume and as the only alternative with a negative estimated value has the lowest indicated bid rate.

Alternative 5

Direct and Indirect Effects

Alternative 5 has the joint lowest estimated pond log value ($505/MBF) along with Alternative 4 (Table TSE-12). It includes a lower percentage of high-value spruce than Alternative 4, but a slightly higher percentage than Alternative 3. This alternative includes young-growth treatment units, which explains the lower pond log value compared to Alternative 2.

This alternative has the second highest estimated logging cost of the action alternatives ($303/MBF) (Table TSE-12). This alternative minimizes the amount of roads required for harvest activities, but, as a result, many units are required to be harvested with a helicopter logging system, which has higher average costs than conventional systems. The reduction in roads also creates longer yarding distances for helicopter operations.

Estimated haul costs under this alternative ($49/MBF) are lower than for Alternatives 3 and 4, and higher than for Alternative 2. Road costs under this alternative ($29/MBF) are substantially lower than the values per MBF under Alternatives 2 and 3, because fewer miles of roads are proposed than under the other alternatives, resulting in lower road building and maintenance costs (Table TSE-12).

Alternative 5 has an indicated advertised value of $6.75/MBF, which is less than the estimated values for Alternatives 2 and 3, but higher than the value for Alternative 4. This relatively low value when compared to Alternatives 2 and 3 is primarily the result of higher logging costs. The higher cost of using helicopter yarding for more units is not offset by the costs of less road construction. This alternative could be still offered because

the indicated advertised value is above the current established minimum rate (FSM 2431.31b). Parts of the alternative could also be redesigned into a more positive offer.

Under Alternative 5, a total of 114.1 MMBF of sawlog volume would be available for harvest (Table TSE-3). Assuming all units and volume were harvested, this alternative would support an estimated 227 logging jobs and 118 to 221 jobs in the sawmill sector, as well as 79 to 114 jobs related to transportation. These jobs would generate an estimated $24.1 million to $25.4 million in direct income (Table TSE-13). This employment would not all occur in one year and estimated job-years do not directly translate into numbers of affected workers.

Total Forest Service financial costs, excluding costs for environmental analysis, would exceed the indicated advertised rate estimated for the entire sale volume under this alternative by approximately $4.9 million (Table TSE-14).

Cumulative Effects

Timber harvest under this alternative and other reasonably foreseeable projects on the 5-year plan would contribute to meeting projected market demand for timber in Southeast Alaska and support logging and sawmill or export jobs. Reasonably foreseeable projects are on the 5-year plan which is periodically updated to add projects. Timber projects listed in Appendix D, Part II and discussed under Alternative 1 would also contribute to the timber supply. Compared to the other action alternatives, Alternative 5 would contribute the second highest volume (less than Alternative 3, more than Alternatives 2 and 4) and has the third highest indicated bid rate.

Issue 2: Old-Growth Habitat LUD Modifications

Issue statement: *Old-Growth Habitat LUD modifications for the small old-growth reserves (OGRs) in Alternative 3 are proposed to expand the suitable timber base within the roaded land base (due to the effect of the Roadless Rule) and in Alternative 4 to modify the reserves for the biologically preferred locations within the project area. This may affect the amount and quality of wildlife habitat protected by the small OGRs, the amount and quality of suitable timber available in the project area, and other resources including fisheries, sensitive plants, scenery, and recreation.*

Alternative 3 includes modifications to some of the small OGRs in the Big Thorne project area. Most of these modifications relocate portions of the small OGRs to be within the 2001 Roadless Rule inventoried roadless areas as much as possible from the current locations where there are existing roads. These roaded portions of the existing OGRs would then be allocated to LUDs where timber harvest would be allowed (i.e., Timber Production, Modified Landscape, and Scenic Viewshed). In two cases the OGRs acreage exceeded the Forest Plan minimum acre requirements and these OGRs were modified to be smaller without any acres relocated in roadless areas.

Alternative 4 includes modifications to the small OGRs based on the biologically preferred locations in the project area as recommended by the interagency review team. This team included biologists from the Forest Service, U.S. Fish and Wildlife Service, and Alaska Department of Fish and Game. Refinements to several proposed modifications were made between the Draft and Final EIS to more accurately represent the biologically preferred OGR designed by the interagency review team (see Chapter 2 for additional detail).

The portions of existing OGRs that were relocated under Alternatives 3 and 4 were reallocated to Timber Production, Modified Landscape, and Scenic Viewshed LUDs, based on the adjacent LUDs and Visual Priority Travel Routes and Use Areas to address scenery concerns.

Units of Measure

The comparison of alternatives for this issue focuses on the following units of measure:

- LUD acreage changes
- Comparison to Forest Plan small OGR criteria (Appendices D and K)
- Acres and volumes suitable for timber production
- Numbers of rare and sensitive plant individuals and populations within OGRs

Analysis Area

The analysis area for direct and indirect effects related to Old-Growth Habitat LUD modifications consists of the VCUs coinciding with the project area. The VCU scale was used since the criteria for small OGRs are based on VCUs (Forest Plan Appendix K) and they were used during the analysis of the Forest Plan to design and evaluate small OGRs. The project area was the analysis area generally used to evaluate the cumulative effects of

the small OGR modifications. The cumulative effects analysis area for timber resources was the Thorne Bay and Craig Ranger Districts (which includes all of Prince of Wales Island and the adjacent islands within the district boundaries).

The Big Thorne EIS tiers to the analysis of cumulative effects at the Forest scale in the 2008 Forest Plan Final EIS (USDA Forest Service 2008c). This analysis fully considered the levels of past and likely future harvest and associated development on NFS and non-NFS lands accounting for projects such as Big Thorne.

Affected Environment

Land Use Designations

As described in Chapter 1, the Forest Plan uses LUDs to guide the management of NFS lands within the Tongass. Each designation provides for a unique combination of activities, practices, and uses. The Big Thorne project area includes the seven LUDs, shown in Table 1-1 and Figure 1-2. The goals and other aspects of each LUD are summarized in Chapter 1.

Tongass Conservation Strategy and Old-growth Reserves

Forest Plan Conservation Strategy

The Forest Plan Conservation Strategy was developed to maintain the integrity of the old-growth forest by retaining intact, largely undisturbed habitat. This strategy, initially incorporated into the 1997 Forest Plan, was reviewed and amended for incorporation into the 2008 Forest Plan. The conservation strategy includes two major components: (1) a forest-wide network of large, medium and small OGRs allocated to the Old-Growth LUD plus all small islands less than 1,000 acres, and (2) a series of standards and guidelines applicable to lands where timber harvest is permitted (the matrix; USDA Forest Service 2008a, 2008b).

The OGR system was designed to maintain habitats of the species that have the most viability concerns (USDA Forest Service 2008b). The reserve network also includes other non-development LUDs such as Wilderness, LUD II, Remote and Semi-Remote Recreation that essentially maintain the old-growth ecosystem. The intent of the reserve system was to help ensure the maintenance of well-distributed viable populations of all old-growth associated wildlife species across the Tongass, with focus on those species that are most sensitive to habitat loss and fragmentation. In general, the home range and dispersal capabilities of old-growth associated species of concern were considered in determining the size, number and spacing of reserves. For a complete review of the Forest Plan Conservation Strategy, including assumptions underlying the design of the OGR system, refer to Appendix D of the 2008 Forest Plan Final EIS (USDA Forest Service 2008c).

Within the matrix (areas outside of reserves), components of the old-growth ecosystem are maintained through standards and guidelines designed to provide for important ecological functions such as dispersal of organisms, movement between forest stands, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees (USDA Forest Service 2008b). Matrix lands include Experimental Forest,

Modified Landscape, Scenic Viewshed, and Timber Production LUDs. Matrix management complements the reserve system by providing habitat at smaller spatial scales, increasing the effectiveness of reserves, and improving landscape connectivity (USDA Forest Service 2008b). Standards and guidelines applicable to these lands include maintenance of the 1,000-foot beach buffer, variable-width stream buffers, and project-level legacy forest structure retention requirements (see Chapter 2). In addition, other Forest-wide standards and guidelines preclude or limit timber harvest in areas of high-hazard soils, steep slopes, karst terrain, and visually sensitive travel routes and use areas. Finally, a number of species-specific standards and guidelines, such as raptor nest and wolf den buffers, set aside old growth, sometimes temporarily, to avoid impacts to the species in question. Additional detail on the rationale behind the standards and guidelines within the matrix is provided in Appendix D of the 2008 Forest Plan Final EIS (USDA Forest Service 2008c).

Old-growth Reserves

The Big Thorne project area includes small OGRs located in VCUs 5790, 5800, 5810, 5820, 5830, 5840, 5850, 5860, 5950, 5960, and 5972 (Figure OGR-1; Figure 1-2 in Chapter 1 displays the locations of the Old-Growth Habitat LUDs in relation to other LUDs and roadless areas). The project area also incorporates other VCUs or portions of VCUs (Table WLD-1) that may contain small OGRs; however, because the Big Thorne Project does not propose any activities in these VCUs, no modifications to the respective OGRs were proposed. A substantial portion of the Honker Divide large OGR complex, which spans several VCUs and is made up of several different LUDs, is within the project area. Medium OGRs have been designated in adjacent VCUs to the north and west. Under the Forest Plan conservation strategy, small OGRs were intended to facilitate functional connectivity (i.e., connectivity through disconnected patches of old-growth forest) between larger reserves and help ensure well-distributed wildlife populations.

During the 2008 Forest Plan Amendment process, an interagency biologist review team (2008 IRT) conducted a forest-wide review of small OGRs because small OGR locations had not been finalized under the 1997 Forest Plan. For each VCU, the 2008 IRT evaluated consistency with Forest Plan OGR acreage requirements (outlined in Appendix K of the Forest Plan). All existing small OGRs meet or exceed the Forest Plan acreage requirements (this includes exceptions for VCUs that are partially designated as very large, large, or medium OGRs where acreage from these reserves count toward the total). Under the Forest Plan, in VCUs partially designated as very large, large, or medium OGRs, there are no requirements for small OGRs (USDA Forest Service 2008c, Appendix D). This evaluation formed the basis for the biologically preferred small OGR locations recommended by the 2008 IRT, which was one of several factors taken into account by the Forest Supervisor in finalizing the small OGR locations under the 2008 Forest Plan. Appendix D of the Forest Plan FEIS includes design criteria that were used in the development of the reserve system (see the Wildlife and Subsistence resource report for additional detail).

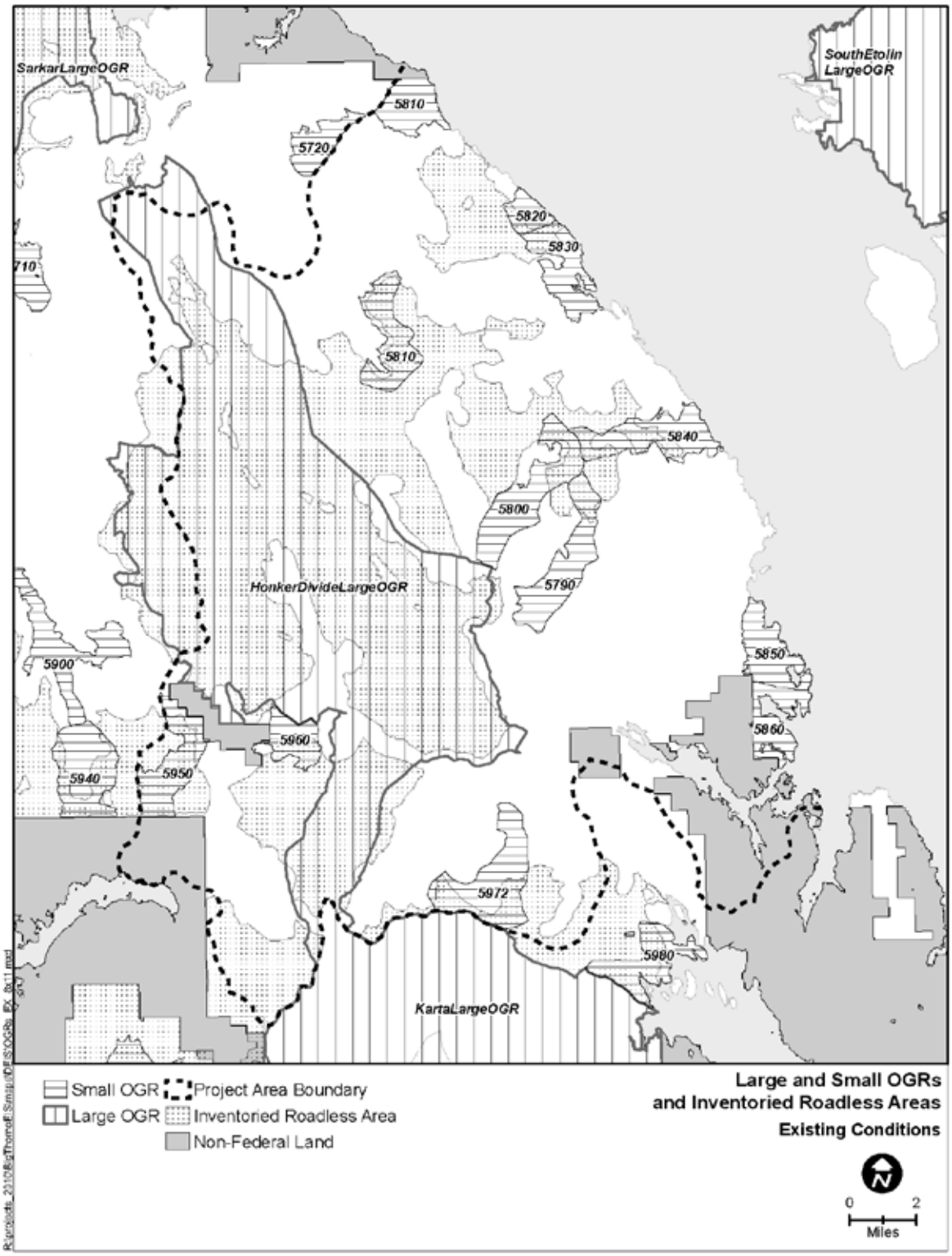

Figure OGR-1. Existing Old-growth Reserves in the Big Thorne Project Area

Existing Small Old-growth Reserves by VCU

This section provides a summary-level description for each of the small OGRs in the project area.

VCU 5790 (Gravelly Creek/Falls Creek) – This small OGR is linear, running southwest to northeast through VCU 5790, connecting to the small OGR in VCU 5800, and approaching to within 3,500 to 4,500 feet of the Honker large OGR. Without a protected connection through a non-development LUD to the Honker large OGR complex through VCU 5780, the existing biological functionality of the complex of small OGRs in VCUs 5790, 5800, and 5840 is diminished due to the high level of previous harvest and natural fragmentation between these VCUs and the Honker large OGR.

VCU 5800 (North Thorne River) – This small OGR is located to the west of the North Thorne drainage. It provides connectivity from the Honker large OGR complex to salt water in the east (Clarence Strait) via the small OGR in VCU 5840, and includes the largest remaining blocks of POG in the VCU.

VCU 5810 (Luck Lake) – This VCU contains a split small OGR consisting of two disconnected pieces. The northern piece, located north of Luck Lake, is entirely roaded but connects Luck Lake to the shoreline and includes deer winter range and large-tree POG (SD 67). The larger, southern piece, located southwest of Luck Creek, is sufficiently sized to meet Forest Plan total and POG acreage requirements. The existing small OGR (the northern and southern pieces combined) acres in this VCU includes low elevation POG, high value deer winter range, and maintenance of shoreline connectivity.

VCU 5820 (Baird Peak) –This small OGR is located along the coastline, east of Baird Peak. It includes some of the remaining contiguous blocks of low elevation POG in the VCU.

VCU 5830 (Ratz Harbor) – This small OGR is split between VCUs 5820 and 5830 (approximately 30 and 70 percent of its acreage located in each, respectively). Some important wildlife habitats (salmon, black bear, wolf, deer, and bald eagle habitat) which exist around Ratz Harbor and Trumpeter Lake and low elevation, high-volume POG stands in the VCU are excluded from the OGR; however, many acres of this wildlife habitat are included in the existing small OGR.

VCU 5840 (Sal Creek) – This small OGR is linear, running east-west between the shoreline and the small OGR in VCU 5800. It includes the largest remaining blocks of POG in the VCU, and provides elevational connectivity to saltwater between the Honker Large OGR via OGRs in VCUs 5790 and 5800.

VCU 5850 (Sandy Beach) – This small OGR is located south of Sandy Beach and consists entirely of low elevation POG. Inclusion of POG in this OGR is important due to the high level of fragmentation from previous harvest, and the limited remaining blocks of POG in this VCU. The existing small OGR also includes coastline that provides important salmon, waterfowl, and black bear habitat and has documented high recreational use; however, it excludes a large block of POG to the north outside the beach buffer (near the Sandy Beach Recreation Area).

VCU 5860 (Thorne Bay/Snug Anchorage) – This small OGR is located adjacent to Snug Anchorage. It includes the last remaining low elevation POG in the VCU, and provides connectivity to the small OGR in VCU 5850.

VCU 5950 (Steelhead Creek) – This small OGR is located west of Control Lake, north of the Steelhead Drainage and south of the highway. Considered by itself, the existing small OGR does not meet minimum acreage requirements; however, the VCU also includes a small portion of the Honker large OGR (Figure OGR-1). Under the Forest Plan, in VCUs partially designated as very large, large, or medium OGRs, there are no requirements for small OGRs (Forest Plan FEIS Appendix D; USDA Forest Service 2008c). The existing small OGR also includes habitat for wolves, deer, black bears, marten, flying squirrels, and goshawks while providing connectivity to OGRs in adjacent VCUs.

VCU 5960 (Control Lake) – This small OGR is located south of the paved highway and east of Control Lake. It is contiguous with the Honker large OGR. Although by itself it does not meet Forest Plan minimum acreage requirements, it is contiguous with, and functions as part of, the Honker large OGR complex (Figure OGR-1). Therefore, it does not by itself need to meet small OGR acreage requirements (Forest Plan FEIS Appendix D; USDA Forest Service 2008c). The OGR in this VCU complements and adds value to the Honker large OGR complex, which provides a significant north/south connectivity corridor across the central Prince of Wales Island region connecting the large Sarkar reserve to the Karta reserve.

VCU 5972 (Angel Lake) – This small OGR is adjacent to the Karta wilderness, extending north toward Angel Lake. A small portion of this OGR (south of Rush Peak) overlaps VCU 5980. The current small OGR location includes a large block of POG; however, it is predominantly high-elevation, high-gradient topography that provides relatively low value wildlife habitat. It does not include low elevation connectivity to salt water or known wolf dens (although active wolf dens are protected by other Forest Plan standards and guidelines).

Timber Resources

Reallocating areas within the Old-growth Habitat LUD (a non-development LUD) to development LUDs, and vice versa, would result in acreage changes to lands considered suitable and available for timber management, since OGRs are classified as not available for timber management. The small OGRs of the project area contain approximately 6,783 acres of forest land that would be considered suitable for timber production if it were in a development LUD.

Under existing conditions, the project area includes approximately 48,477 acres of suitable forest land, including 22,387 acres of old growth timber and 26,090 acres of young growth timber. Overall, this land base represents about 16 percent of the mapped suitable land base on the Thorne Bay and Craig Ranger Districts.

Fish Resources

The existing small OGRs of the project area contain an estimated 47 miles of Class I streams, 27 miles of Class II streams, and 101 miles of Class III streams. Part of the

objectives of the Old-Growth Habitat LUD (USDA Forest Service 2008a) is to provide old-growth forest habitats, in combination with other LUDs, to maintain viable fish populations, contribute to habitat capability of fish resources, and support sustainable human subsistence and recreational uses. Timber harvest and road construction would be allowed only under specific circumstances because, according to the Forest Plan, forest land is classified as unsuitable for timber production and new road construction is generally considered inconsistent with LUD objectives. However, even with development LUD designation, the riparian and other standards and guidelines and BMPs in place for timber harvest will be adequate to ensure that no additional adverse effects occur to riparian habitats and fish resources in the project area.

Sensitive and Rare Plant Resources

Although there are no threatened or endangered plant species on the Tongass National Forest, a number of sensitive and rare species inhabit the Tongass (see Botany section later in this chapter). Many of these plants find habitats within OGRs and grow in or adjacent to old-growth forest stands. Modifying OGR boundaries may change the number of known populations included within OGRs.

Two species of sensitive plants are known to exist in the project area: lesser round-leaved orchid (*Platanthera orbiculata*), and a lichen (*Lobaria amplissima*). An estimated 4,019 lesser round-leaved orchid plants in 120 populations are known to occur in the project area. Combined, the OGRs of the project area (including all non-development LUDs that make up an OGR) contain an estimated 63 percent of the individual plants and 35 percent of the known populations, in whole or in part. Four populations of the lichen, *Lobaria amplissima*, are known in the project area, containing an estimated 25 individuals. However, none of these known populations occur fully or partially in OGRs.

Five rare species are known to exist in the project area: western meadowrue (*Thalictrum occidentale*), lance leaf grapefern (*Botrychium lanceolatum*), whiteflower rein orchid (*Piperia candida*), seaside bittercress (*Cardamine angulate*), and northern moonwort (*Botrychium pinnatum*).

Ten of the 15 populations of western meadowrue known from the project area occur entirely or partially within OGRs, including the Honker Divide large OGR. Nearly 3,000 individual plants are known from the project area and an estimated 56 percent of these occur in small and large OGRs. An estimated 1,319 whiteflower rein orchid plants in 30 populations are known to occur in the project area. Combined, the OGRs of the project area contain an estimated 51 percent of the individual plants and 43 percent of the known populations, in whole or in part.

No populations of lance leaf grapefern or seaside bittercress occur within OGRs. The only two known populations of northern moonwort in the project area occur in the Honker Divide large OGR at the northern end of the Rio Roberts lobe.

Subsistence Resources

The existing small OGRs provide deer winter habitat within the reserve system and roads within the OGRs provide access for subsistence uses; thus modifications have the potential to affect the abundance and distribution of, access to, and competition for deer

depending on whether or not these areas are available for harvest. The existing small OGRs in the project area include 3,213 acres of deep snow deer winter habitat (high-volume POG below 800 feet elevation). See Issue 3 for a description of existing subsistence resources.

Scenery Resources

Scenery resources are maintained to a high degree within OGRs; they are assigned a scenic integrity objective (SIO) of high. Development LUDs, such as Modified Landscape and Timber Production, maintain the value of scenery resources to a lesser degree. Among the development LUDs, Scenic Viewshed generally has the highest SIOs, followed by Modified Landscape, which is followed by Timber Production; however, they are assigned in consideration of the scenery resources present in the area. Therefore, modification of OGR boundaries may change the degree to which scenic values are maintained in several areas.

Recreation Resources

Recreation and tourism use in OGRs is managed to meet the Old-growth Habitat LUD objectives for fish and wildlife resources and habitat, with recreation-related structures designed to be compatible with the needs of old-growth associated species. The Old-growth Habitat LUD is intended to generally provide Semi-Primitive ROS settings, but the Forest Plan recognizes that more developed settings may be present due to authorized activities, existing use patterns, and activities in adjacent LUDs. Together, the 11 potentially affected small OGRs in the Big Thorne project area include approximately 25,500 acres. About 36 percent of this total is allocated to Semi-Primitive ROS settings, with the remaining 64 percent allocated to Roaded settings, primarily Roaded Modified (RM) (63 percent). ROS settings are discussed in more detail in the separate Recreation section later in this chapter.

Thirteen developed recreation sites are located in the Big Thorne project area (see the Recreation section). None of these sites are located within the potentially affected small OGRs.

Environmental Consequences

Land Use Designations

The modification of OGR boundaries in the project area would result in changes in the total acreage of each LUD. Table OGR-1 presents a summary of the LUD acreages in the project area for each alternative, and compares them with the acreage available under existing conditions.

Table OGR-1. Forest Plan Land Use Designation Acreage in the Project Area by Alternative

Land Use Designation (LUD)	Alt 1, 2, and 5 (acres)	Alt 3 (acres)	% change from Alt 1	Alt 4 (acres)	% change from Alt 1
Non-Development LUDs [1/]					
Research Natural Area	1,621	1,621	-	1,621	-
Old-growth Habitat	74,949	75,539	+1%	79,220	+6%
Scenic River	14,180	14,180	-	14,180	-
Recreational River	2,932	2,932	-	2,932	-
Total Non-Development LUDs	**93,682**	**94,272**	**+1%**	**97,952**	**+5%**
Development LUDs [2/]					
Timber Production	60,685	59,581	-2%	59,648	-2%
Modified Landscape	58,884	59,771	+2%	56,294	-4%
Scenic Viewshed	4,426	4,054	-8%	3,783	-15%
Total Development LUDs	**123,997**	**123,407**	**-<1%**	**119,726**	**-3%**
Total NFS Lands	217,679	217,679	-	217,679	-
Non-NFS Lands	14,169	14,169	-	14,169	-
Total (NFS + Non-NFS) Lands	**231,848**	**231,848**	-	**231,848**	-
2001 IRA[3/] included in Non-Development LUDs	**56,574**	**62,942**	**+11%**	**58,182**	**+3%**
2001 IRA[3/] included in Development LUDs	**35,659**	**29,292**	**-18%**	**34,051**	**-5%**

1/ Non-development LUDs generally do not permit timber harvest or road construction.
2/ Development LUDs allow timber harvest and road construction under certain conditions.
3/ 2001 IRA = 2001 Roadless Rule inventoried roadless area

Alternatives 1, 2, and 5

Under Alternatives 1, 2, and 5, no modifications to the Old-growth Habitat LUD are proposed.

Alternative 3

Under Alternative 3, changes to the Old-growth Habitat LUD would occur through modifications of most small OGR boundaries in the project area. Emphasis was to move more of these reserves into inventoried roadless areas to further protect these areas and to increase the amount of roaded areas allocated to development LUDs. The overall net effect would be that the total acreage in the Old-growth Habitat LUDs of the project area would increase by 1 percent, and the total acreage in development LUDs would decrease by less than1 percent.

Alternative 4

Under Alternative 4, changes to the Old-growth Habitat LUD would occur through modifications of several small OGR boundaries in the project area. Emphasis was to locate these reserves in the most biologically preferred areas based on habitats and connectivity to the large and medium OGRs. The overall net effect would be that the total acreage in the Old-growth Habitat LUDs of the project area would increase by 6 percent, and the total acreage in development LUDs would decrease by 3 percent.

Old-Growth Reserves

Evaluation and modification of small OGRs during project-level environmental analysis are addressed under Old-growth LUD Standard and Guideline WILD1(B). Small OGRs may be modified so that they meet the minimum criteria specified in Appendix K of the Forest Plan (pp. K-1 through K-3); reserve location, composition, and size may be also be adjusted provided that the modified OGR meets the minimum criteria and provides comparable achievement of Old-growth LUD goals and objectives (Forest Plan p. 3-62). Forest Plan goals and objectives for Old-Growth Habitat LUDs (Forest Plan p. 3-57) include:

Goals

- Maintain areas of old-growth forests and their associated natural ecological processes to provide habitat for old-growth associated resources.
- Manage early seral conifer stands to achieve old-growth forest characteristic structure and composition based upon site capability.

Objectives

- Provide old-growth forest habitats to maintain viable populations of fish and wildlife species and subspecies that are closely associated with old-growth forests.
- Contribute to the habitat capability of fish and wildlife resources to support sustainable human subsistence and recreational uses.
- Maintain biodiversity and ecological processes associated with old-growth forests.
- Limit roads, facilities, and permitted uses to those compatible with old-growth forest habitat objectives.
- Allow existing natural or previously harvested early seral conifer stands to evolve naturally to old-growth forest habitats, or apply silvicultural treatments to accelerate forest succession to achieve old-growth forest structural features.

Determination of comparable achievement of Old-growth LUD goals and objectives is subjective, but is supported by a review of additional OGR design criteria provided in Appendix D of the 2008 Forest Plan Final EIS (USDA Forest Service 2008c). Pursuant to Forest Plan Appendix K, an IRT comprising USFWS, ADF&G, and Forest Service biologists met in Thorne Bay on June 2–3, 2011, to review the existing small OGRs in the project area. The 2011 IRT evaluated the potential for moving small OGRs into 2001 roadless areas and the biological values of the current small OGR locations. A report summarizing the findings of the 2011 IRT is included in the Big Thorne Project record; determinations regarding comparable achievement of Old-growth LUD goals and objectives are based on this report. A comparison of existing small OGRs (Alternatives 1, 2, and 5) and small OGR modifications proposed under Alternatives 3 and 4 based on Appendices K and D design criteria is summarized below and in Table OGR-2. Modifications to small OGRs that do not maintain comparable achievement of Old-growth LUD goals and objectives have the potential to reduce the functioning of the reserve system, either through reductions in the habitat elements maintained within the reserve system or connectivity provided by the reserve system.

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Table OGR-2. Comparison of Old-growth Reserves Based On Forest Plan Design Criteria

	5790-Gravelly Creek/Falls Creek			5800-North Thorne River		5810-Luck Lake		5820-Baird Peak		
	Alt 1, 2, 5	Alt 3	Alt 47/	Alt 1, 2, 4, 5	Alt 3	Alt 1, 2, 4, 5	Alt 3	Alt 1, 2, 5	Alt 3	Alt 4
Forest Plan Appendix K Criteria										
Required OGR (acres)[1/]	1,714			2,462		3,210		657		
Required POG (acres)[2/]	857			1,321		1,605		328		
OGR acres	2,745	3,058[8/]	2,989[9/]	3,116	3,658	3,749	3,443	765	902	1,151
POG acres	872	976[8/]	1,027[9/]	1,594	2,093	2,271	1,720	587	687	887
Acreage requirements met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Appendix D General Design Criteria										
Circular rather than linear to maximize interior habitat/minimize fragmentation effects	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Minimizes roads (total road miles)	3.1	-0.7	+0.5	5.5	-5.1	6.4	-5.6	0.0	+/-0	+/-0.0
Minimizes early seral habitat (acres)	128	+4	+27	279	-255	182	-116	0	+/-0	+/-0.0
Riparian/beach/estuary habitats (Class I-IV stream miles)	15.7	+1.8	+1.9	34.0	+5.1	26.2	-8.4	7.8	+1.0	-5.6
Includes largest remaining block of POG in VCU?	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rare/Underrepresented features (large tree POG acres) [3/]	14	+4	+48	368	+132	630	-242	287	+3	+69
Deep snow deer & marten habitat (acres)[4/]	49	-24	+49	220	-137	507	-383	215	+10	+28
Goshawk & murrelet nesting habitat (acres)[5/]	152	-26	+49	827	+537	1,314	-367	503	+29	+102
Other Considerations										
Maintains Connectivity	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Low elevation POG (acres)[6/]	49	-22	+155	756	-667	945	-562	371	+64	+176
Comparable Achievement of Old-growth Habitat LUD Goals and Objectives?[10/]	NA	No. Does not maintain connection to west.	Yes. Biologically preferred location.	NA	No. Reduces inclusion of POG habitats and does not maintain connection between Honker large OGR and saltwater (Clarence Strait).	NA	No. Reduces inclusion of low-elevation, high value deer habitat, and connectivity between Luck Lake and the shoreline.	NA	Yes. Increases inclusion of POG.	Yes

1/ 16% of VCU acres
2/ 50% of OGR acres
3/ SD67 type
4/ High-volume POG ≤ 800 ft elevation
5/ High-volume POG all elevations (indicative of optimal goshawk and marbled murrelet nesting habitat due to presence of large trees and snags, though both species may use all POG types; see Issue 3)
6/ All POG ≤ 800 ft elevation (representative of low-elevation travel corridors important for many species)
7/ Most changes under alternative 4 made in VCU 5780;
8/ Includes acreage addition in VCU 5850 (274 acres total; 112 acres POG)
9/ Includes acreage addition in VCU 5780 (235 acres total; 154 acres POG)
10/ Determination of comparable achievement is based on findings of the 2011 IRT.

Table OGR-2. Comparison of Old-growth Reserves Based On Forest Plan Design Criteria (cont.)

	5830-Ratz Harbor			5840-Sal Creek		5850-Sandy Beach			5860-Thorne Bay/Snug Anchorage	
	Alt 1, 2, 5	Alt 3	Alt 4	Alt 1, 2, 4, 5	Alt 3	Alt 1, 2, 5	Alt 3	Alt 4	Alt 1, 2, 4, 5	Alt 3
Forest Plan Appendix K Criterion										
Required OGR (acres)[1/]	1,998			2,226		1,680			1,131	
Required POG (acres)[2/]	999			1,113		840			565	
OGR acres	2,039[7/]	2,387	2,369	2,650	2,865	1,906	1,703	2,185	1,620	1,194
POG acres	944[7/]	989	1,019	1,487	1,278	1,049	870	1,262	1,311	922
Acreage requirements met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Appendix D General Design Criteria										
Circular rather than linear to maximize interior habitat/minimize fragmentation effects	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Minimizes roads (miles)	8.0	-1.5	+0.8	5.6	-5.0	4.2	-2.7	+1.8	5.2	-5.2
Minimizes early seral habitat (acres)	659	-74	+9	147	-83	23	-6	+44	66	+/-0
Riparian/beach/estuary habitats (Class I-IV stream miles)	12.6	+0.1	+3.4	25.3	-2.4	12.8	-2.1	+1.3	11.2	-4.1
Includes largest remaining block of POG in VCU?	No	No	Yes	Yes	No	Yes	No	Yes	Yes	No
Rare/Underrepresented features (large tree POG acres)[3/]	158	-34	-69	292	-193	24	-23	+26	249	-147
Deep snow deer & marten habitat (acres)[4/]	122	-78	-28	280	-260	249	-50	+62	736	-270
Goshawk & murrelet nesting habitat (acres)[5/]	299	-2	-20	680	-192	249	-50	+62	736	-270
Other Considerations										
Maintains Connectivity	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No
Low elevation POG (acres)[6/]	622	-169	-15	561	-496	1,049	-179	+213	1,311	-390
Comparable Achievement of Old-growth Habitat LUD Goals and Objectives?[8/]	NA	No. Does not include higher value wildlife habitats (lower elevation high-volume stands) in this VCU.	Yes. Biologically preferred location.	NA	No. Severs connection between the Honker large OGR and the beach.	NA	No. Removes high value, low-elevation stands that are limited in this VCU	Yes. Biologically preferred location.	NA	No. Reduces inclusion of low-elevation POG and does not maintain connectivity to small OGR in VCU 5850

1/ 16% of VCU acres
2/ 50% of OGR acres
3/ SD67 type
4/ high-volume POG ≤ 800 ft elev.
5/ High-volume POG all elevations (indicative of optimal goshawk and marbled murrelet nesting habitat due to presence of large trees and snags, though both species may use all POG types; see Issue 3)
6/ All POG ≤ 800 ft elevation (representative of low-elevation travel corridors important for many species)
7/ Approximately 30% of acreage mapped in VCU 5820 (386 acres total; 299 acres POG) and 70% mapped in VCU 5830 (1,654 acres total, 646 acres POG).
8/ Determination of comparable achievement is based on findings of the 2011 IRT

Table OGR-2. Comparison of Old-growth Reserves Based On Forest Plan Design Criteria (cont.)

	5950-Steelhead Creek			5960-Control Lake		5972-Angel Lake		
	Alt 1, 2, 5	Alt 3	Alt 4	Alt 1, 2, 3, 5	Alt 4	Alt 1, 2, 5	Alt 3	Alt 4
Forest Plan Appendix K Criteria								
Required OGR (acres)[1/]	2,836			1,974		3,405		
Required POG (acres)[2/]	1,418			987		1,702		
OGR acres	2,294[8/]	2,563	2,994	1,251[8/]	2,569	3,371[7/, 8/]	3,087[8/]	4,443
POG acres	1,406[8/]	1,449	1,981	394[8/]	1,068	1,803[7/]	1,499[8/]	1,840
Acreage requirements met?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Appendix D General Design Criteria								
Circular rather than linear to maximize interior habitat/minimize fragmentation effects	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Minimizes roads (miles)	3.6	-1.2	+1.1	3.7	+/-0	6.3	-3.0	+11.7
Minimizes early seral habitat (acres)	267	-63	+1	6	+/-0	320	-27	+126
Riparian/beach/estuary habitats (Class I stream miles)	27.8	+2.2	+8.7	11.9	+12.6	30.0	-9.4	-4.5
Includes largest remaining block of POG in VCU?	No	No	Yes	Yes	Yes	Yes	No	Yes
Rare/Underrepresented features (large tree POG acres)[3/]	472	-30	+422	77	+357	549	-86	-369
Deep snow deer & marten habitat (acres)[4/]	462	-23	+429	91	+346	281	-107	+132
Goshawk & murrelet nesting habitat (acres)[5/]	832	-48	+495	134	+427	922	-152	-465
Other Considerations								
Connectivity	Yes	Yes	Yes	No	Yes	No	No	Yes
Low elevation POG (acres)[6/]	721	-59	+476	317	+501	510	-256	+1,178
Comparable Achievement of Old-growth Habitat LUD Goals and Objectives?[9/]	NA	Yes. Includes important wildlife habitats and maintains connectivity.	Yes. Biologically preferred location.	NA	Yes. Biologically preferred location.	NA	No. Removes large blocks of POG and does not protect wolf habitat; reduces connectivity to salt water (Salt Chuck).	Yes. Biologically preferred location.

1/ 16% of VCU acres
2/ 50% of OGR acres
3/ SD67 type
4/ High-volume POG ≤ 800 ft elev.
5/ High-volume POG all elevations (indicative of optimal goshawk and marbled murrelet nesting habitat due to presence of large trees and snags, though both species may use all POG types; see Issue 3)
6/ All POG ≤ 800 ft elevation (representative of low-elevation travel corridors important for many species)
7/ Split between VCUs 5972 and 5980 (357 acres total, 144 acres POG)
8/ In combination with acres from the portion of the Honker large OGR located in VCUs 5950,5960, and 5972, as allowed under the Forest Plan (Appendix D; USDA Forest Service 2008a), minimum acreage requirements would be met.
9/ Determination of comparable achievement is based on findings of the 2011 IRT

Alternative 1, 2, and 5

Direct and Indirect Effects

Under Alternatives 1, 2, and 5 no modifications to small OGRs are proposed. Therefore, the LUD acreages would remain the same as under existing conditions.

Cumulative Effects

Alternatives 1, 2, and 5 would not change the cumulative effects to the old-growth reserve system as analyzed by the Forest Plan Final EIS because no modifications to small OGRs are proposed. No other present or reasonably foreseeable projects in the analysis area would modify LUDs, and effects of individual development projects that might involve small OGR modifications are expected to be within the limits allowed by the Forest Plan, and would be analyzed separately and cumulatively as they are proposed.

Alternative 3

Direct and Indirect Effects

Alternative 3 involves an exchange of 5,873 acres within roaded portions of small OGRs that would become available for timber harvest, for 6,367 acres within Inventoried Roadless Areas that would be designated as Old-growth Habitat LUD (Figure OGR-2; Table OGR-2). Detailed maps showing the specific changes for each LUD and OGR are provided in Figures OGR-3, OGR-4, and OGR-5. No modifications are proposed in VCU 5960.

All modified small OGRs proposed under Alternative 3 would meet minimum Forest Plan acreage requirements (Table OGR-2). Table OGR-2 also provides a comparison of Forest Plan Appendix D and K criteria.. Alternative 3 would increase the total acres of small OGRs within VCUs 5790, 5800, 5820, 5830, 5840, and 5950. POG would also increase in these VCUs with the exception of VCU 5840, in which POG would be reduced. Modifications in VCUs 5810, 5850, 5860, and 5972 would reduce total OGR and POG acreages. The remaining small OGRs in the project area would not change (Table OGR-2).

Most of the proposed small OGR modifications under Alternative 3 reduce the miles of roads and early seral habitat included in the small OGR, and also increase the amount of suitable timber available for harvest. However, these modifications also reduce the amount of POG (including large-tree POG and low elevation POG), goshawk and marbled murrelet nesting habitat, and deer and marten winter habitat in some small OGRs. The following paragraphs describe the effects for each VCU individually. Alternative 3 OGR modifications would also reduce the amount of interior forest habitat included in the reserve system by 368 acres. For a discussion of effects on suitable timber acres and timber volume see the Timber Resources subsection below.

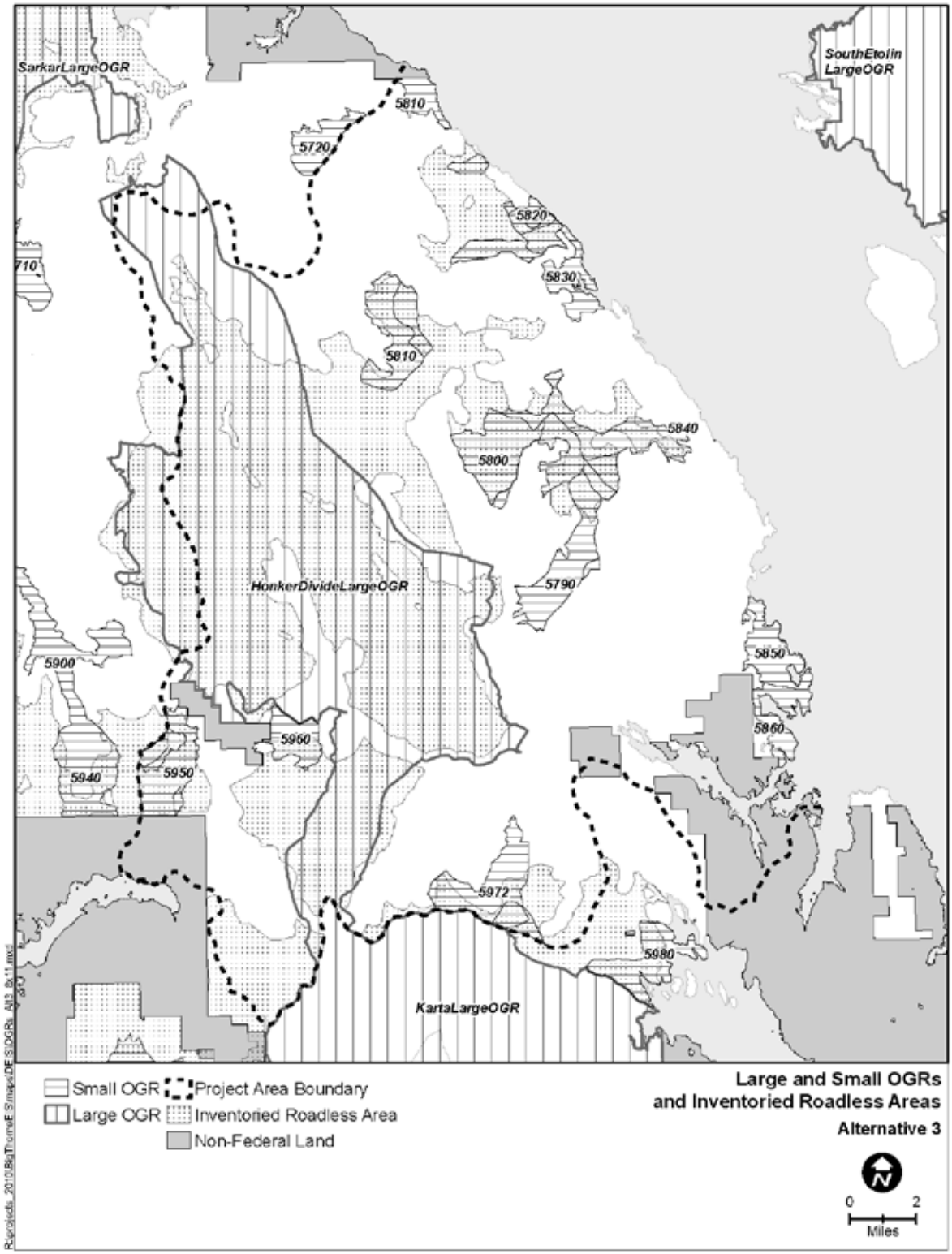

Figure OGR-2. Old-growth Reserves under Alternative 3 in the Big Thorne Project Area

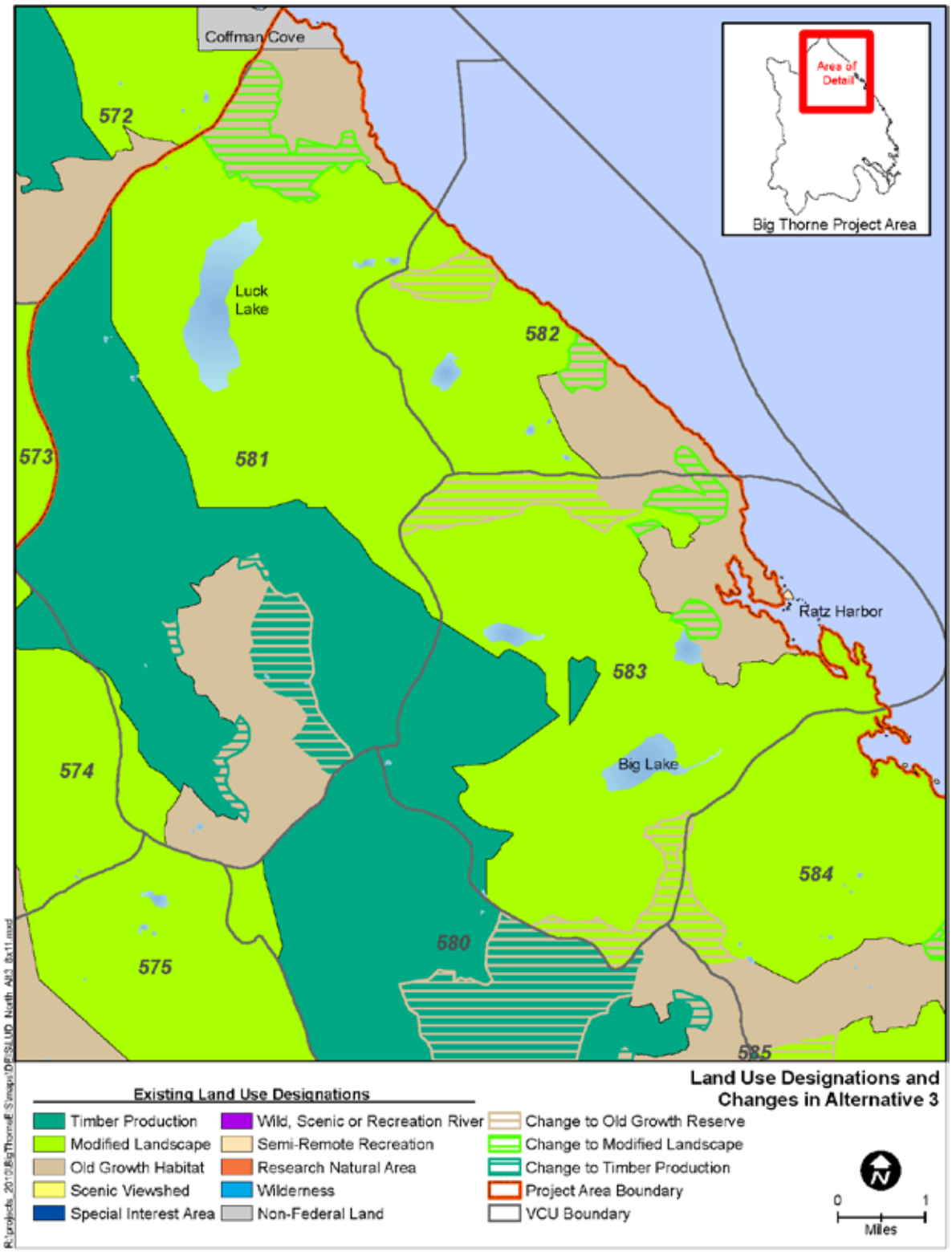

Figure OGR-3. Small Old-growth Reserves under Alternative 3 in the North Portion of the Big Thorne Project Area Showing LUD Changes

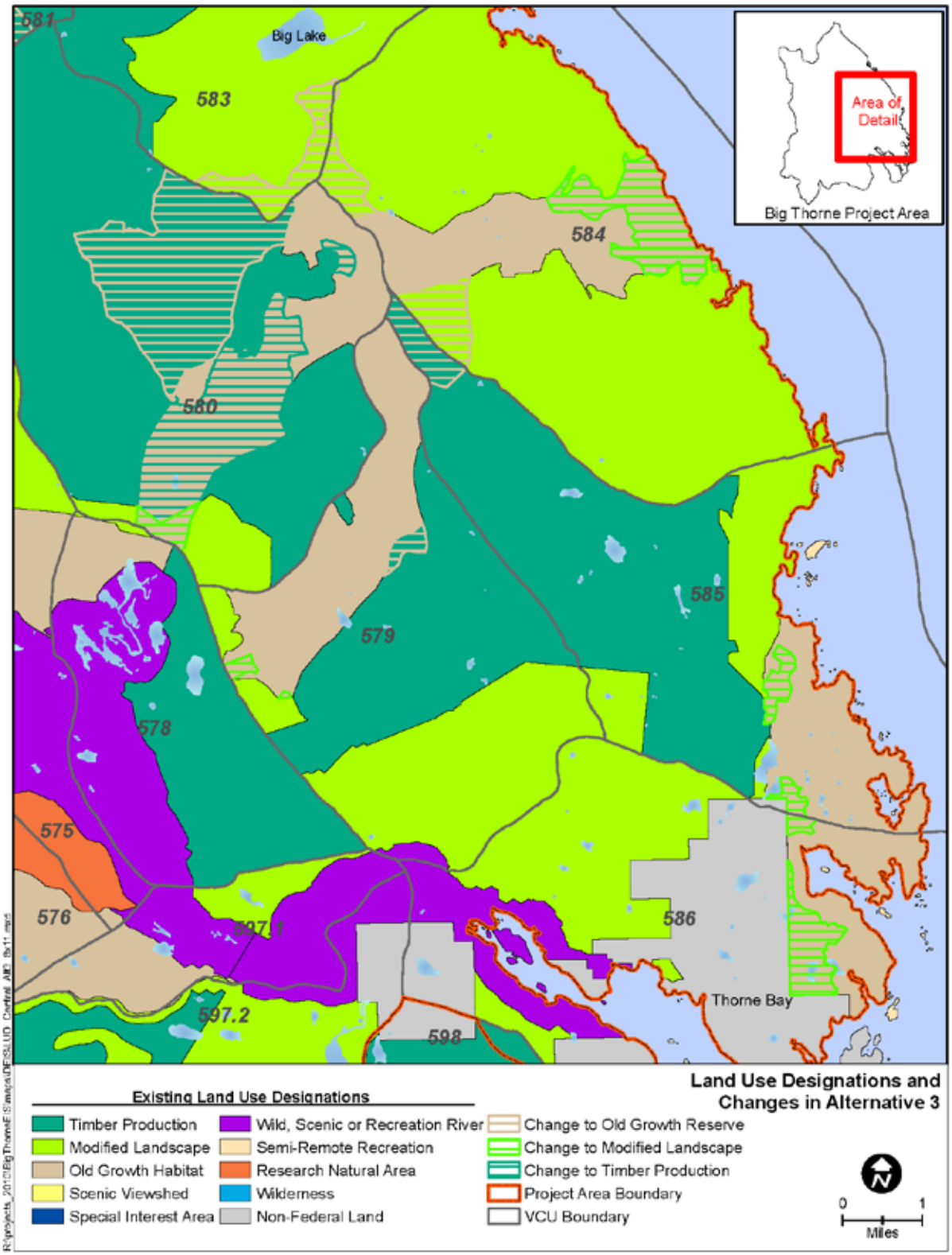

Figure OGR-4. Small Old-growth Reserves under Alternative 3 in the Central Portion of the Big Thorne Project Area Showing LUD Changes

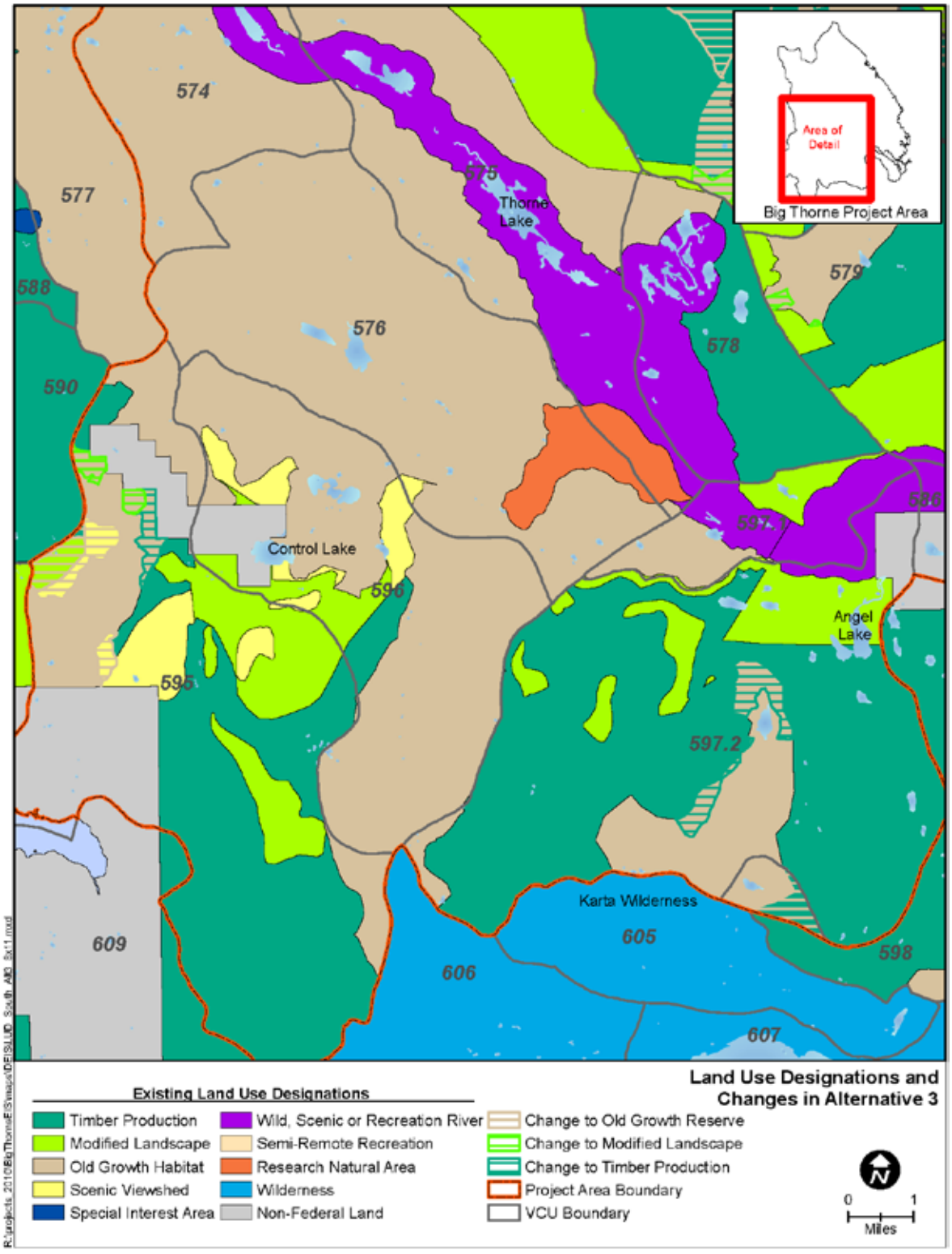

Figure OGR-5. Small Old-growth Reserves under Alternative 3 in the South Portion of the Big Thorne Project Area Showing LUD Changes

VCU 5790 (Gravelly Creek/Falls Creek) – Modifications under Alternative 3 would remove acreage from the western edge of the VCU and add acreage (all roadless) along Slide Creek in VCU 5850 to enhance the connection between small OGRs in VCUs 5840 and 5790. Acres would also be added along Gravelly Creek. This would result in an overall increase in small OGR acres (313 acres) and POG acres (104 acres) (Table OGR-2). This would exceed Forest Plan Appendix K small OGR acreage requirements and would also provide connectivity through the VCU between the Honker large OGR and saltwater, although through a higher-elevation corridor.

Alternative 3 would reduce the amount of road miles (23 percent), and increase the acres of early seral habitat (3 percent), miles of streams (11 percent) and the amount of under-represented features (large-tree POG; 29 percent) included in the small OGR (Table OGR-2). Alternative 3 would decrease the amount of deep snow marten habitat/deer winter range (49 percent), potential goshawk and marbled murrelet nesting habitat (17 percent), and would no longer include the largest block of POG in the VCU within the small OGR. However, only 10 percent of the deep snow marten habitat/deer winter range and 16 percent of the potential goshawks and marbled murrelet nesting habitat currently in VCU 5790, respectively, were encompassed by the existing small OGR. Additionally, the modified OGR would be more linear rather than circular, but this is consistent with the existing small OGR. The modified OGR in VCU 5790 would not provide comparable achievement of Old-growth LUD goals and objectives because it would reduce the connection between the Honker large OGR and the small OGR in VCU 5780 to the west.

VCU 5800 (North Thorne River) – Modifications under Alternative 3 would remove acreage from the low-elevation river drainage comprising the southwestern portion of the OGR and add higher-elevation acreage (all within roadless) to the north, adjacent to VCU 5830. This would result in an overall increase in small OGR and POG acres, exceeding Forest Plan Appendix K small OGR acreage requirements (Table OGR-2).

Alternative 3 would reduce the number of road miles (93 percent) and early seral habitat (91 percent), and increase the amount of streams (15 percent), under-represented features (large-tree POG; 36 percent), and potential goshawk and murrelet nesting habitat (65 percent; Table OGR-2) included within the small OGR. The exchange of lower-elevation acreage would reduce the amount of low elevation POG (88 percent) and deep snow deer and marten habitat (62 percent; OGR-2) included in the OGR. Alternative 3 would also remove the current low elevation connection between the Honker large OGR complex and the shoreline; however, the 2011 IRT felt that the current connectivity to saltwater would be maintained through a different route via VCU 5840. The modified OGR in VCU 5800 would not provide comparable achievement of Old-growth LUD goals and objectives because it does not protect the limited remaining POG in the VCU (including a large block of low-elevation, south-facing, high-volume POG on the south face of Ratz Mountain, which is an important elevational migration corridor and winter range for migratory deer) or maintain connectivity from Honker large OGR to saltwater in the east (Clarence Strait) via the small OGR in VCU 5840.

VCU 5810 (Luck Lake) – This VCU contains a split small OGR consisting of two disconnected pieces, one in the northern portion of the VCU and one in the southern portion. Modifications proposed under Alternative 3 include removal of acreage along the

western edges of the northern and southern piece of this OGR, and the addition of acreage along the eastern edge of the southern piece. This modification would reduce the overall number of small OGR and POG acres but the resulting acreage would continue to exceed Forest Plan Appendix K acreage requirements (Table OGR-2). Under Alternative 3 approximately 25 percent of the total POG in VCU 5810 would be encompassed by the small OGR, compared to 33 percent within the existing small OGR.

Alternative 3 would reduce the amount of roads (88 percent) and early seral forest (64 percent) included in the small OGR; however it would also reduce the amount of stream miles (32 percent), under-represented features (large-tree POG; 38 percent), deep snow deer and marten habitat (75 percent), potential goshawk and marbled murrelet nesting habitat (28 percent), and low-elevation POG (59 percent) included. Although some low-elevation POG, including deep snow marten habitat/deer winter range would be maintained by a Class I stream buffer along Eagle Creek, Alternative 3 would reduce connectivity to the shoreline. The modified OGR in VCU 5810 would not provide comparable achievement of Old-growth LUD goals and objectives because it would reduce the acres of low-elevation, high value deer habitat (replacing them with higher elevation, lower value acres), and connectivity between Luck Lake and the shoreline.

VCU 5820 (Baird Peak) – Under Alternative 3, the roaded portion of this small OGR along the shoreline would be removed and acreage would be added in a separate, disconnected location to the north. This would increase the overall number of small OGR and POG acres, continuing to exceed Forest Plan Appendix K acreage requirements (Table OGR-2). Additional modifications to VCU 5820 would occur in association with the Ratz Harbor small OGR (split between VCUs 5820 and 5830). These modifications would result in a net increase in OGR and POG acres (136 total acres and 99 POG acres; Table OGR-2). See discussion under VCU 5830 below for additional discussion.

Alternative 3 would result in no change in the number of road miles or acres of early seral forest included in the small OGR, and would result in minor increases in the amount of stream miles (13 percent), under-represented features (large-tree POG; 1 percent), deep snow deer winter range and marten habitat (5 percent), potential goshawk and marbled murrelet nesting habitat (7 percent), and low-elevation POG (17 percent; Table OGR-2) included. The modified OGR would continue to include one of two remaining patches of deer winter range and the largest contiguous block of POG in the VCU. The modified OGR in VCU 5820 would provide comparable achievement of Old-growth LUD goals and objectives because it would increase the amount of POG included.

VCU 5830 (Ratz Harbor) – Modifications under Alternative 3 would remove acres in VCUs 5820 and 5830 near Ratz Point, and add acres in VCU 5830 along the northern and southern VCU boundaries. This would in result in a net increase in OGR acres (348 acres) and in POG acres (44 acres; Table OGR-2).

Alternative 3 would reduce the amount of roads (19 percent) and early seral forest (11 percent) and increase the amount of stream miles (1 percent) included in the small OGR. However, it would reduce the amount of under-represented features (large-tree POG; 22 percent), deep snow deer winter range and marten habitat (64 percent), potential goshawk and marbled murrelet nesting habitat (1 percent), and low-elevation POG (27 percent; Table OGR-2). The modified OGR in VCU 5830 would not provide comparable

achievement of Old-growth LUD goals and objectives because it does not protect higher value wildlife habitat in VCU 5830 (low-elevation high-volume stands included in the existing small OGR).

VCU 5840 (Sal Creek) – Modifications under Alternative 3 would remove acres along the shoreline, and add acres adjacent to the western portion of the existing OGR to broaden the connection to OGRs in VCUs 5790 and 5800. However, this would eliminate the connection provided by the current small OGR between the Honker large OGR complex and coastal habitats and would eliminate protection of the largest remaining blocks of POG in the VCU. This would result in an increase in OGR acres but a decrease in POG acres, though both would continue to exceed Forest Plan Appendix K acreage requirements (Table OGR-2).

Alternative 3 would reduce the amount of roads (89 percent) and early seral forest (56 percent) included in the small OGR, but would also reduce the amount of stream miles (9 percent), under-represented features (large-tree POG; 66 percent), deep snow winter range and marten habitat (93 percent), potential goshawk and marbled murrelet nesting habitat (28 percent), and low-elevation POG (88 percent; Table OGR-2) included. High-volume and large-tree POG are already limited in this VCU, comprising 44 and 28 percent of the original (1954) POG (see Table WLD-1 under Issue 3). The modified OGR in VCU 5840 does not provide comparable achievement of Old-growth LUD goals and objectives because it would reduce connectivity between the Honker large OGR complex and coastal habitats.

VCU 5850 (Sandy Beach) – Modifications under Alternative 3 would result in a decrease in total acreage and POG acreage from the western boundary of this small OGR. Because the existing small OGR exceeds minimum acreage requirements, and would continue to do so under Alternative 3, no replacement acres would be required (Table OGR-2). However, high elevation roadless acres were added in the extreme northern portion of this VCU to the OGR in VCU 5790 to improve connectivity.

Alternative 3 would reduce the amount of roads (64 percent) and early seral forest (26 percent) included in the small OGR, but would also reduce the amount of streams (16 percent), under-represented features (large-tree POG; 95 percent), deep snow deer winter range and marten habitat (20 percent), potential goshawk and murrelet nesting habitat (20 percent), and low-elevation POG (17 percent; Table OGR-2) included. This would exacerbate the condition of limited amounts of POG in this VCU. Currently, 41, 18, and 10 percent of the total original (1954) total, high-volume, and large-tree POG remain in VCU 5850 (see Table WLD-1 under Issue 3). The modified OGR in VCU 5850 would not provide comparable achievement of Old-growth LUD goals and objectives because it would remove high value, low-elevation stands currently protected by the existing small OGR.

VCU 5860 (Thorne Bay/Snug Anchorage) – Modifications under Alternative 3 would remove acreage and POG acreage along this small OGRs western edge and south of Snug Anchorage. Because the existing small OGR exceeds the minimum acreage requirements, and would continue to do so under Alternative 3, no replacement acres would be required (Table OGR-2).

Alternative 3 would reduce the amount of road miles (100 percent) included in the small OGR, would result in no change to the amount of early seral habitat included, but would also decrease the amount of streams (37 percent), under-represented features (59 percent), deep snow deer winter range and marten habitat (37 percent), potential goshawk and marbled murrelet nesting habitat (37 percent), and low-elevation POG (30 percent; Table OGR-2) included. Modifications would also eliminate inclusion of the largest remaining blocks of POG in the VCU. The majority of the POG contained in the resulting small OGR consists of beach fringe. Because POG is already limited in this VCU (currently 54, 48, and 39 percent of original (1954) total, high-volume, and large-tree POG remain, respectively; see Table WLD-1 under Issue 3), additional reductions in the inclusion of POG in the reserve system under Alternative 3 would exacerbate these conditions. The modified OGR in VCU 5860 would not provide comparable achievement of Old-growth LUD goals and objectives because it would not include the largest remaining block of POG in the VCU or maintain connectivity to the small OGR to the north in VCU 5850.

VCU 5950 (Steelhead) – Modifications under Alternative 3 would remove acreage from the northeastern fringes adjacent to State land and add acreage along the western and southeastern flanks of the existing small OGR. This would result in an increase in OGR and POG acreage. Although the small OGR alone would not meet Forest Plan Appendix K acreage requirements, in combination with acres from the portion of the Honker large OGR located in VCU 5950, as allowed under the Forest Plan (Appendix D; USDA Forest Service 2008a), minimum acreage requirements would be met. As noted above, due to the presence of the large OGR in this VCU, there are no requirements for a separate small OGR. The shape of the small OGR under Alternative 3 would also now be more circular than linear, increasing the amount of interior forest habitat (Table OGR-2).

The proposed modifications would maintain connectivity to OGRs in adjacent VCUs and would result in reduction in the amount of road miles (33 percent) and early seral forest (24 percent) and an increase in streams (8 percent; Table OGR-2) included in the small OGR. Alternative 3 would also result in a minor reduction in the amount of under-represented features (large-tree POG; 6 percent), deep snow deer winter range and marten habitat (5 percent), potential goshawk and marbled murrelet nesting habitat (6 percent), and low-elevation POG (8 percent; Table OGR-2). The modified OGR in VCU 5950 would provide comparable achievement of Old-growth LUD goals and objectives because it includes important wildlife habitats and maintains connectivity.

VCU 5960 (Control Lake) – No modifications to the small OGR in VCU 5960 are proposed under Alternative 3.

VCU 5972 (Angel Lake) – Modifications under Alternative 3 would remove acres from the northern and western edges of the existing small OGR, and add acres to its southeastern lobe (in VCUs 5972 and 5980). This would decrease the amount of OGR and POG acres, which would now be less than Forest Plan Appendix K acreage requirements for a separate small OGR in this VCU. However, a portion of the Honker large OGR is located in the northern end of the VCU; therefore, the small OGR does not by itself need to meet Forest Plan Appendix K acreage requirements (Forest Plan FEIS Appendix D; USDA Forest Service 2008c).

Alternative 3 would reduce the amount of roads (48 percent) and early seral forest (8 percent) included in the small OGR, but would also reduce the amount of streams (31 percent), under-represented features (large-tree POG; 16 percent), deep snow deer winter range and marten habitat (38 percent), potential goshawk and murrelet nesting habitat (17 percent), and low-elevation POG (50 percent; Table OGR-2) included. Alternative 3 would also eliminate inclusion of the largest remaining block of POG in the VCU. The modified OGR in VCU 5972 would not provide comparable achievement of Old-growth LUD goals and objectives because it would remove substantial POG stands from the OGR, and replace them with largely non-forested lands within the adjacent Roadless area. It would also not protect critical wolf habitat, or provide a wildlife travel corridor through VCUs 5972 and 5980 to saltwater at the Salt Chuck.

Cumulative Effects

Alternative 3 would result in a net gain of 590 acres in the Old-growth Habitat LUD; however, there would be a net reduction of 843 acres of POG included in small OGRs (Tables OGR-1 and OGR-2). There would be a corresponding net increase in suitable and available timber (see Timber Resources section for a VCU by VCU discussion of suitable and available timber acres and volumes).

Past and ongoing timber harvest is discussed below by VCU. No other present or reasonably foreseeable projects in the analysis area would modify LUDs, and effects of individual development projects that might involve small OGR modifications are expected to be within the limits allowed by the Forest Plan, and would be analyzed separately and cumulatively as they are proposed.

VCU 5790 (Gravelly Creek/Falls Creek) – VCU 5790 currently maintains 40 percent of the original total POG present in 1954, of which 31 percent would be included in the modified OGR (an decrease of less than 1 percent). This does not include the 274 acres which would be added to the reserve system in adjacent VCU 5850 through this modification (approximately 4 percent of the existing POG in that VCU). Therefore, the exchange in amounts of various habitats and features, identified as design criteria in Appendix D of the Forest Plan FEIS, between the existing small OGR and the modified small OGR has potential to result in additional loss of these habitats should these vacated areas be harvested in the future. Moreover, there are no large ongoing or reasonably foreseeable projects in VCU 5790.

VCU 5800 (North Thorne River) – VCU 5800 currently maintains 72 percent of the original total POG present in 1954, of which 30 percent would be included in the modified OGR (an increase of 7 percent). Moreover, there are no large ongoing or reasonably foreseeable projects in VCU 5800.

VCU 5810 (Luck Lake) – VCU 5810 currently maintains 50 percent of the original total POG present in 1954, of which 25 percent would be included in the modified OGR (a decrease of 8 percent). Therefore, the exchange in amounts of various habitats and features (Forest Plan Appendix D design criteria) between the existing small OGR and the modified small OGR under Alternative 3 has potential to result in additional loss of these habitats should these vacated areas be harvested in the future (see the Timber Resources section below). There are no large ongoing or reasonably foreseeable projects in VCU 5810.

VCU 5820 (Baird Peak) – VCU 5820 currently maintains 100 percent of the original total POG present in 1954 of which 28 percent would be included in the modified OGR (an increase of 4 percent). It is considered an intact landscape as defined in the Forest Plan FEIS (i.e., maintaining more than 95 percent of its original POG; USDA Forest Service 2008c). Moreover, there are no large ongoing or reasonably foreseeable projects in VCU 5820.

VCU 5830 (Ratz Harbor) – VCU 5830 currently maintains 56 percent of the original total POG present in 1954, of which 15 percent would be included in the modified OGR (an increase of 2 percent). This OGR is split between two VCUs, so this does not include modifications in adjacent VCU 5820 which would result in 10 percent of the original POG in VCU 5820 being included in this small OGR (a decrease of 2 percent). Moreover, there are no large ongoing or reasonably foreseeable projects in VCU 5830.

VCU 5840 (Sal Creek) – VCU 5840 currently maintains 59 percent of the original total POG present in 1954, of which 18 percent would be included in the modified OGR (a decrease of 8 percent); however, this does not include 237 acres of POG added to the OGR in adjacent VCU 5830 (5 percent of the POG in VCU 5830). Therefore, the exchange in amounts of various habitats and features (Forest Plan Appendix D design criteria) between the existing small OGR and the modified small OGR under Alternative 3 has potential to result in additional loss of these habitats should these vacated areas be harvested in the future. There are no large ongoing or reasonably foreseeable projects in VCU 5840.

VCU 5850 (Sandy Beach) – VCU 5850 currently maintains 41 percent of the original total POG present in 1954, of which 28 percent would be included in the modified OGR (a decrease of 6 percent). In addition, a small amount of harvest (22 acres) would occur in this VCU under the North Thorne Bay State timber harvest project. Therefore, the cumulative effects of the exchange in amounts of various habitats and features (Forest Plan Appendix D design criteria) under Alternative 3 has potential to result in additional loss of these habitats should these vacated areas be harvested in the future.

VCU 5860 (Thorne Bay/Snug Anchorage) – VCU 5860 currently maintains 54 percent of the original total POG present in 1954, of which 15 percent would be included in the modified OGR (a decrease of 6 percent). In addition, approximately 455 acres within this VCU is planned for harvest on State lands (North Thorne Bay). Therefore, the exchange in amounts of various habitats and features (Forest Plan Appendix D design criteria) between the existing small OGR and the modified small OGR under Alternative 3 has potential to result in additional loss of these habitats should these vacated areas be harvested in the future.

VCU 5950 (Steelhead) – VCU 5950 currently maintains 70 percent of the original total POG present in 1954, of which 21 percent would be included in the modified OGR (an increase of less than 1 percent). In addition, approximately 65 acres could be harvested in VCU 5950 under the Control Lake timber harvest project.

VCU 5960 (Control Lake) – No small OGR modifications are proposed in VCU 5960 under Alternative 3; therefore, there would be no cumulative effects.

VCU 5972 (Angel Lake) – VCU 5972 currently maintains 65 percent of the original total POG present in 1954, of which 16 percent would be included in the modified OGR (a decrease of 3 percent). This small OGR is split between two VCUs, so this does not take into account modifications in adjacent VCU 5980 which would result in 3 percent of the original POG in VCU 5980 being included in this small OGR (an increase of less than 1 percent). In addition, approximately 256 acres could be harvested in VCU 5972 under the Control Lake timber harvest project. Therefore, the exchange in amounts of various habitats and features (Forest Plan Appendix D design criteria) between the existing small OGR and the modified small OGR under Alternative 3 has potential to result in additional loss of these habitats should these vacated areas be harvested in the future.

Alternative 4

Direct and Indirect Effects

Under Alternative 4, the small OGR locations and/or boundaries would be adjusted in accordance with the biologically preferred alternative developed by the 2011 IRT (Figure OGR-6). Detailed maps showing the specific changes for each LUD and OGR are provided in Figures OGR-7, OGR-8, and OGR-9. For a description of changes between the Draft and Final EIS, see Chapter 2. This review took into account the biologically preferred locations identified during previous small OGR reviews. Areas vacated by small OGR modifications would be designated as Timber Production or Modified Landscape and made available for timber harvest. All alternative OGRs, as proposed under Alternative 4, would meet Forest Plan minimum acreage requirements (Table OGR-2). Table OGR-2 also provides a comparison of Forest Plan Appendix D and K criteria. Most modifications under Alternative 4 would increase the amount of POG and associated wildlife habitats (e.g., deer winter habitat, low-elevation POG, and large-tree POG). Alternative 4 would also increase the amount of interior forest habitat included in OGRs by 794 acres. The following paragraphs describe the effects for each VCU individually. For a discussion of suitable timber acres and timber volume see the Timber Resources subsection below.

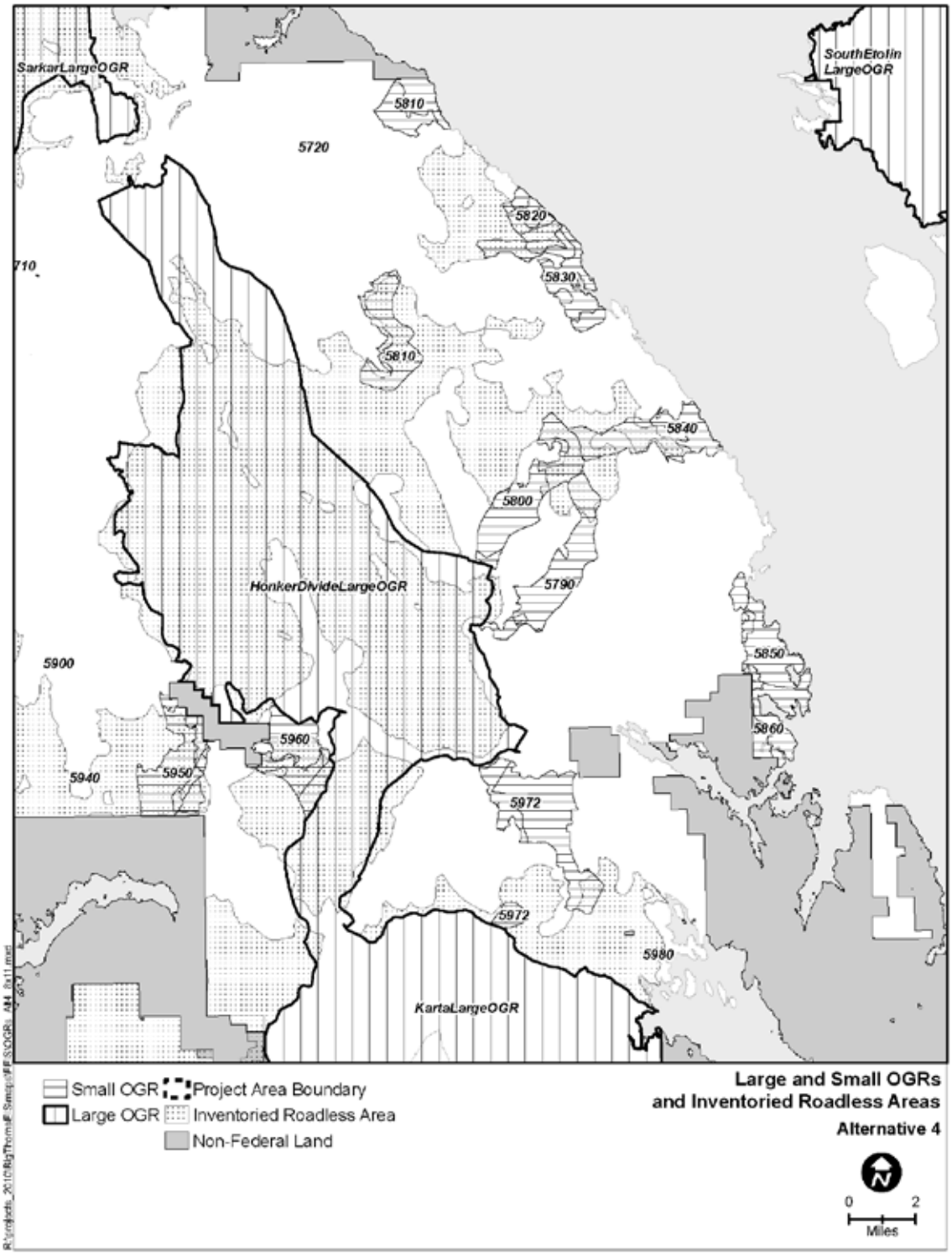

Figure OGR-6. Old-growth Reserves under Alternative 4 in the Big Thorne Project Area

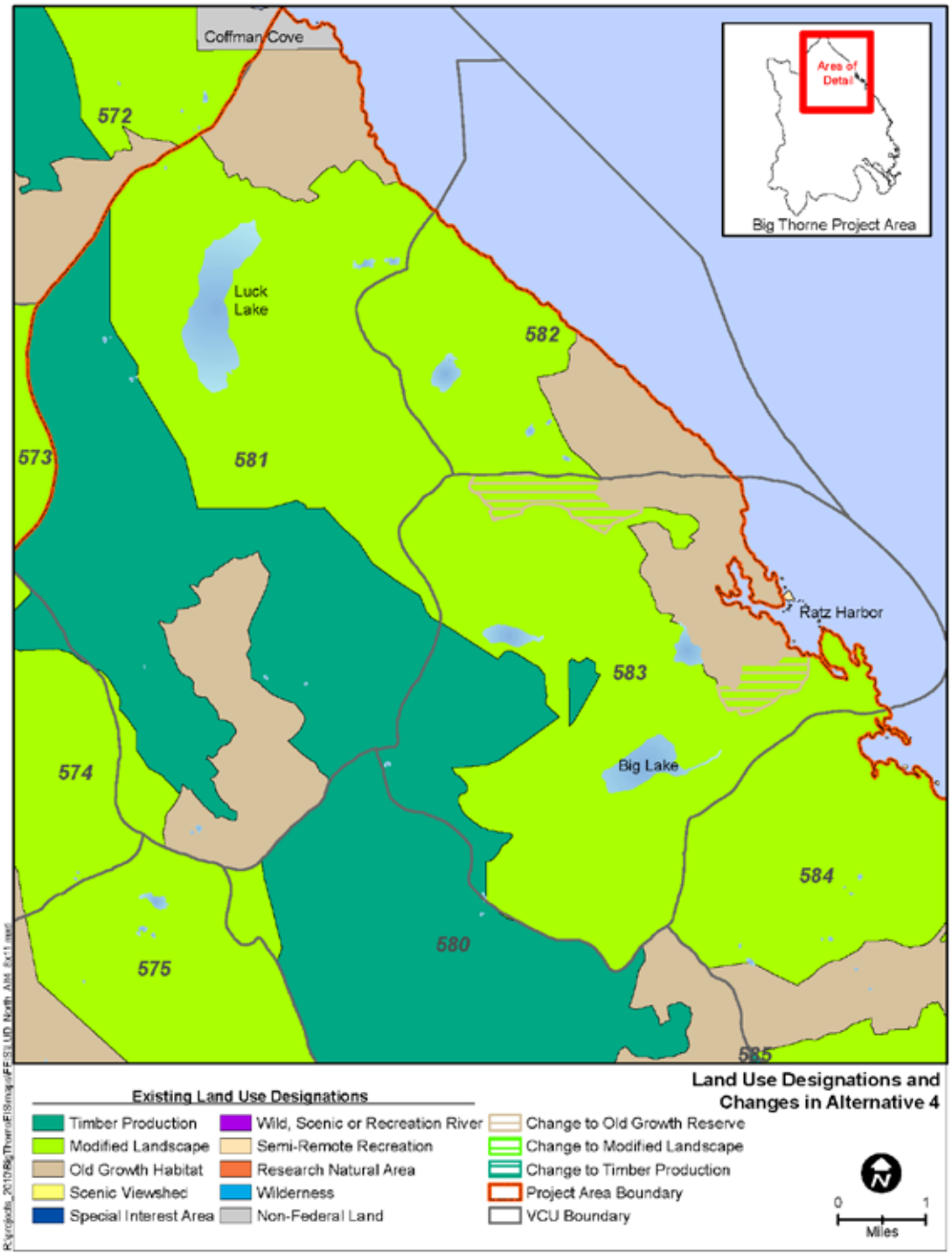

Figure OGR-7. Small Old-growth Reserves under Alternative 4 in the North Portion of the Big Thorne Project Area Showing LUD Changes

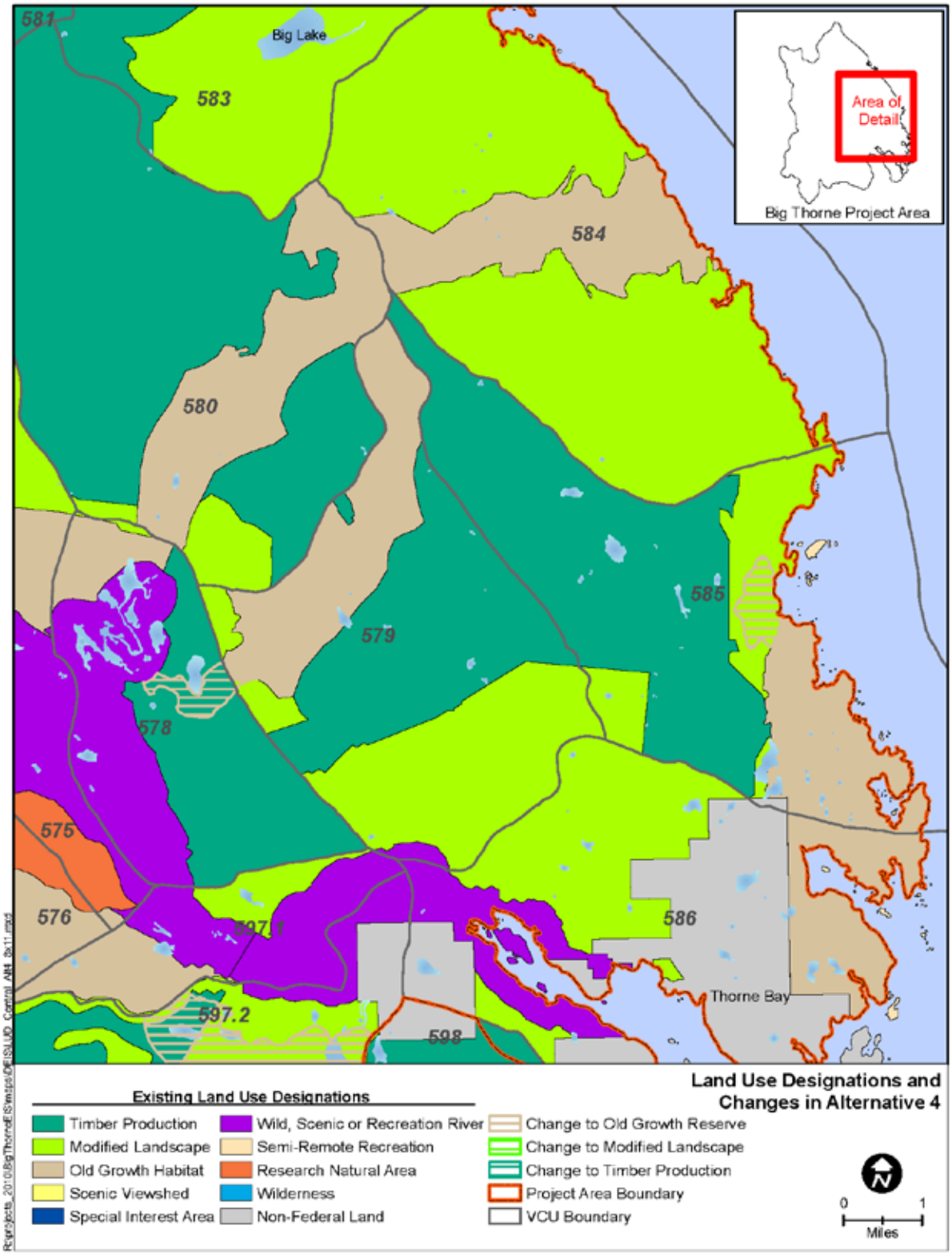

Figure OGR-8. Small Old-growth Reserves under Alternative 4 in the Central Portion of the Big Thorne Project Area Showing LUD Changes

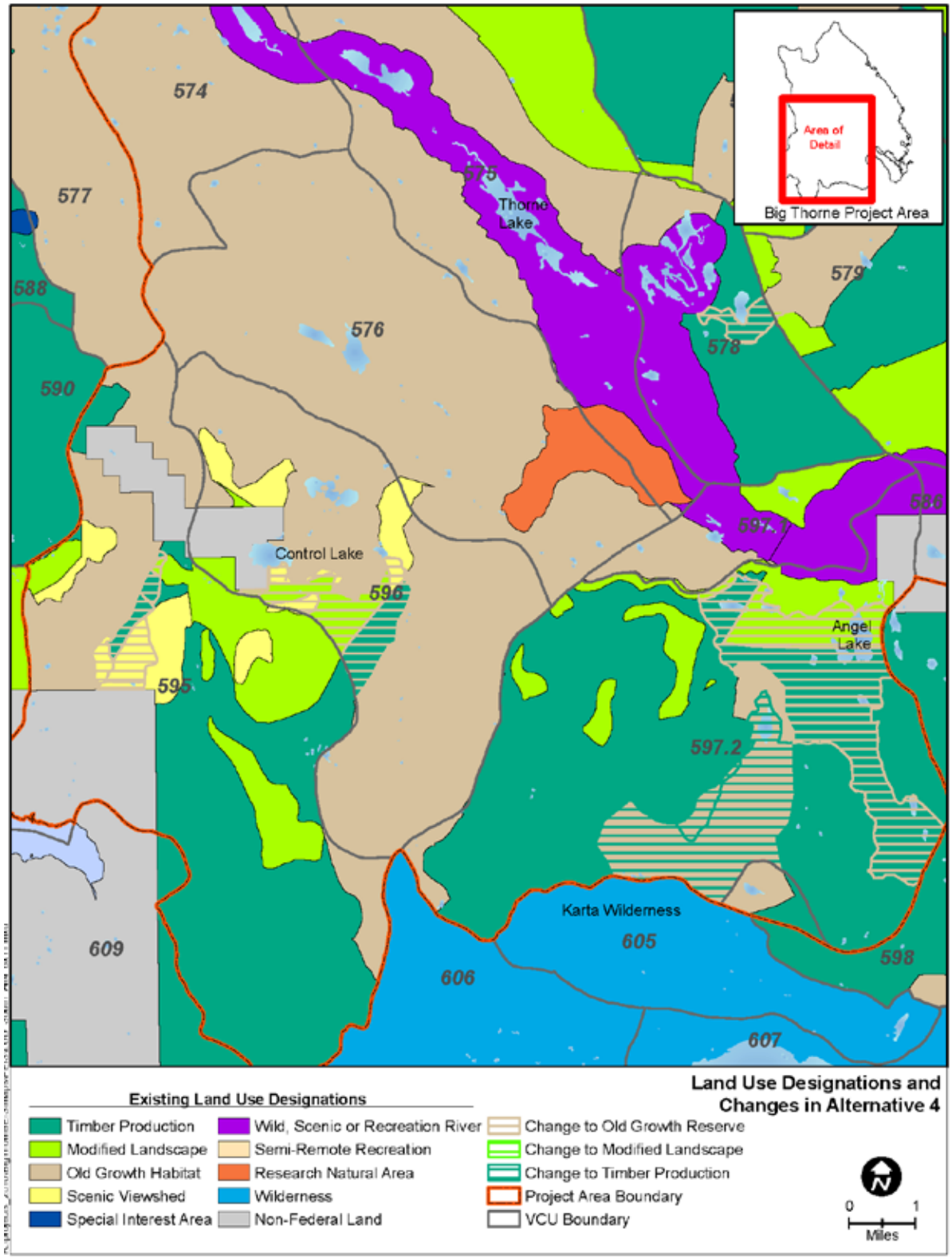

Figure OGR-9. Small Old-growth Reserves under Alternative 4 in the South Portion of the Big Thorne Project Area Showing LUD Changes

VCU 5790 (Gravelly Creek/Falls Creek) – Alternative 4 would add acreage in VCU 5780 to provide a direct connection to the Honker large OGR complex. Note that very minor changes (addition of 9 acres) are proposed to the existing OGR in VCU 5790, with the remaining changes in adjacent VCU 5780. This would improve the biological functionality of the complex of small OGRs in VCUs 5790, 5800, and 5840 while continuing to meet minimum acreage requirements (Table OGR-2). No modifications are proposed to the OGR in VCU 5780 because the acres are mapped as large OGR.

Although Alternative 4 would slightly increase the amount of roads (16 percent) and early seral forest (21 percent) in the small OGR, Alternative 4 would substantially increase the amount of under-represented features (large-tree POG; 273 percent), deep snow deer winter range and marten habitat (101 percent), and low-elevation POG (315 percent; Table OGR-2) included. Smaller increases would also occur in the amount of streams (12 percent) and potential goshawk and marbled murrelet nesting habitat (32 percent; Table OGR-2). The modified OGR in VCU 5790 would provide comparable achievement of Old-growth LUD goals and objectives because it is in the biologically preferred location.

VCU 5800 (North Thorne River) – There is no change proposed under Alternative 4 for VCU 5800.

VCU 5810 (Luck Lake) – There is no change proposed under Alternative 4 for VCU 5810.

VCU 5820 (Baird Peak) –To better meet the Forest Plan Appendix K criterion that small OGR boundaries should follow recognizable features, Alternative 4 shifts the boundary shared by the adjacent small OGRs in VCUs 5820 and 5830 (which is currently in VCU 5820) to follow the VCU boundary. Thus, under Alternative 4all acreage currently counted towards the small OGR in adjacent VCU 5830, would now count toward the small OGR in VCU 5820. This would increase protection of low elevation POG (48 percent), deep snow deer winter range and marten habitat (13 percent), potential goshawk and marbled murrelet nesting habitat (25 percent), and under-represented features (large-tree POG; 24 percent; Table OGR-2) while continuing to meet acreage requirements (Table OGR-2). Alternative 4 would make no measureable change in the amount of roads, early seral forest included in the small OGR. There would be a decrease in the amount of streams (71 percent; Table OGR-2). The modified OGR in VCU 5820 would provide comparable achievement of Old-growth LUD goals and objectives because it is in the biologically preferred location.

VCU 5830 (Ratz Harbor) –To better meet the Forest Plan Appendix K criterion that small OGR boundaries should follow recognizable features, Alternative 4 shifts the boundary shared by OGRs in VCUs 5820 and 5830 (which is currently in VCU 5820) to follow the VCU boundary. Thus, under Alternative 4 OGR acreage in VCU 5820 formerly counted towards VCU 5830, would count toward VCU 5820. Alternative 4 would also add acres south of Trumpeter Lake and to the west of the existing OGR. With these modifications the small OGR in VCU 5830 would include the largest remaining block of POG in the VCU. It also includes an area that, based on ADF&G data, supports high bear use. Alternative 4 would also increase the amount of streams (27 percent), in the small OGR. This was a tradeoff for a slight increase in the amount of road miles (10 percent) and early seral habitat (1 percent), and decreases in the amount of deep snow deer

winter range and marten habitat (23 percent), potential goshawk and marbled murrelet nesting habitat (7 percent), under-represented features (large-tree POG; 43 percent), and low-elevation POG (2 percent) included in the OGR (Table OGR-2). Because these modifications place OGR acres in the biologically preferred location this tradeoff was deemed acceptable by the 2011 IRT. The modified OGR in VCU 5830 would provide comparable achievement of Old-growth LUD goals and objectives because it is in the biologically preferred location.

VCU 5840 (Sal Creek) – There is no change proposed under Alternative 4 for VCU 5840.

VCU 5850 (Sandy Beach) –Alternative 4 would add acreage to the north to include a large block of POG outside the beach buffer. This would increase the OGR and POG acres, continuing to exceed Forest Plan Appendix K acreage requirements. Alternative 4 would increase the amount of roads (1.8 miles; 43 percent) and early seral forest (44 acres; 191 percent) included in the small OGR. This was a tradeoff for increased inclusion of POG habitats which are currently limited in this VCU which maintains 41, 18, and 10 percent of the original total, high-volume, and large-tree POG remaining, respectively (see Table WLD-1 under Issue 2). Alternative 4 would increase the amount of under-represented features (large-tree POG; 26 acres; 110 percent), deep snow deer winter range and marten habitat (62 acres; 25 percent), potential goshawk and marbled murrelet nesting habitat (62 acres; 25 percent), and low-elevation POG (213 acres; 20 percent; Table OGR-2) included in the OGR. Because these modifications place OGR acres in the biologically preferred location this tradeoff was deemed acceptable by the 2011 IRT. The modified OGR in VCU 5850 would provide comparable achievement of Old-growth Habitat LUD goals and objectives because it is in the biologically preferred location.

VCU 5860 (Thorne Bay/Snug Anchorage) – There is no change proposed under Alternative 4 for VCU 5860.

VCU 5950 (Steelhead) – Alternative 4 would expand the small OGR in VCU 5950 to the east to include the entire contiguous block of POG habitat currently straddling the eastern boundary of the existing small OGR. This would increase the OGR and POG acres, exceeding Forest Plan Appendix K acreage requirements. The shape of the small OGR under Alternative 4 would now be more circular than linear, increasing the amount of interior forest habitat included (Table OGR-2).

Alternative 4 would increase the amount of roads (31 percent) and early seral habitats (less than 1 percent) included in the small OGR, but it would substantially increase the amount of streams (30 percent), under-represented features (large-tree POG; 89 percent), deep snow deer winter range and marten habitat (89 percent), potential goshawk and marbled murrelet nesting habitat (59 percent), and low-elevation POG (66 percent; Table OGR-2). The small OGR under Alternative 4 would also encompass the largest remaining block of POG in the VCU. The modified OGR in VCU 5950 would provide comparable achievement of Old-growth LUD goals and objectives because it is in the biologically preferred location.

VCU 5960 (Control Lake) –Alternative 4 would add acres to the south of the existing small OGR (south of Control Lake) to improve connectivity and encompass areas of high quality wolf and goshawk habitat. Alternative 4 would result in no change the amount of early seral habitat or roads included in the small OGR; however, it would result in substantial increases in the amount of streams (106 percent), under-represented features (large-tree POG; 463 percent), deep snow deer winter range and marten habitat (379 percent), potential goshawk and marbled murrelet nesting habitat (320 percent), and low-elevation POG (158 percent). With the addition of these acres, this OGR now directly connects to the Honker large OGR along both the north and south boundaries.

All additions to the existing OGR are within roadless. Therefore modifications proposed under Alternative 4 would not affect the amount of suitable timber available for harvest. The modified OGR in VCU 5960 would provide comparable achievement of Old-growth LUD goals and objectives because it is in the biologically preferred location.

VCU 5972 (Angel Lake) –Alternative 4 would relocate the small OGR to the east, surrounding Angel Lake. In this location, the small OGR would protect known wolf dens (however wolf dens are already provided protection under the Forest Plan) and the only low elevation wildlife travel corridor leading from the Honker large OGR (through VCUs 5972 and 5980) to saltwater at Salt Chuck. Alternative 4 would also increase the amount of roads (183 percent), early seral forest (49 percent), and streams (15 percent). Alternative 4 would decrease the amount of under-represented features (large-tree POG; 67 percent), potential goshawk and marbled murrelet nesting habitat (50 percent), but would increase the amount of deep snow deer winter range and marten habitat (47 percent) and low-elevation POG (231 percent) included in the small OGR. The 2011 IRT felt that the exchange of some wildlife habitat values for the low elevation corridor connecting the large Honker OGR complex with saltwater was beneficial overall. The modified OGR in VCU 5972 would provide comparable achievement of Old-growth LUD goals and objectives because it is in the biologically preferred location.

Cumulative Effects

Alternative 4 would result in a net gain of 4,270 acres in the Old-growth Habitat LUD, including a net increase of 2,029 acres of protected POG, through the implementation of the biologically preferred adjustments to small OGRs (Tables OGR-1 and OGR-2). These modifications were intended to include the largest remaining blocks of POG within each VCU, and important wildlife habitats within the reserve system, and provide functional connectivity between OGRs and other non-development LUDs. Additionally, the exchange in amounts of various habitats and features (design criteria in Appendix D of the Forest Plan FEIS; USDA Forest Service 2008c) between the existing small OGRs and the modified small OGRs under Alternative 4 would substantially increase the inclusion of POG habitats in the reserve system, reducing the proportion available for harvest.

No other present or reasonably foreseeable projects in the analysis area would modify LUDs, and effects of individual development projects that might involve small OGR modifications are expected to be within the limits allowed by the Forest Plan, and would be analyzed separately and cumulatively as they are proposed.

VCU 5790 (Gravelly Creek/Falls Creek) – VCU 5790 currently maintains 40 percent of the original total POG present in 1954, of which 31 percent would be included in the

modified OGR (an increase of less than 1 percent). Additional POG would be included in the reserve system under this modification in adjacent VCU 5780 (4 percent of the original POG in VCU 5780). Additionally, the exchange in amounts of various habitats and features (design criteria in Appendix D of the Forest Plan FEIS) between the existing small OGR and the modified small OGR under Alternative 4 would substantially increase the inclusion of POG habitats in the reserve system, reducing the proportion available for harvest. Moreover, there are no large ongoing or reasonably foreseeable projects in VCU 5790.

VCU 5800 (North Thorne River) – No small OGR modifications are proposed in VCU 5800 under Alternative 4; therefore, there would be no cumulative effects.

VCU 5810 (Luck Lake) – No small OGR modifications are proposed in VCU 5810 under Alternative 4; therefore, there would be no cumulative effects.

VCU 5820 (Baird Peak) – VCU 5820 currently maintains 100 percent of the original total POG present in 1954, of which 28 percent would be included in the modified OGR (an increase of 4 percent). It is considered an intact landscape as defined in the Forest Plan FEIS (i.e., maintaining more than 95 percent of its original POG; USDA Forest Service 2008c). There are no large ongoing or reasonably foreseeable projects in VCU 5820, and modifications would result in a minor exchange in the amounts of various habitats and features (design criteria in Appendix D of the Forest Plan FEIS).

VCU 5830 (Ratz Harbor) – VCU 5830 currently maintains 56 percent of the original total POG present in 1954, of which 21 percent would be included in the modified OGR (an increase of 8 percent). However, the existing small OGR was split between VCUs 5820 and 5830, and it should be noted that this modification would reduce the amount of POG included in the reserve system in adjacent VCU 5820 (8 percent of the original POG in VCU 5820). Moreover, there are no large ongoing or reasonably foreseeable projects in VCU 5830.

VCU 5840 (Sal Creek) – No small OGR modifications are proposed in VCU 5840 under Alternative 4; therefore, there would be no cumulative effects.

VCU 5850 (Sandy Beach) – VCU 5850 currently maintains 41 percent of the original total POG present in 1954, of which 41 percent would be included in the modified OGR (an increase of 7 percent). A small amount of harvest (22 acres) would occur in this VCU under the North Thorne Bay State timber harvest project.

VCU 5860 (Thorne Bay/Snug Anchorage) – No small OGR modifications are proposed in VCU 5860 under Alternative 4; therefore, there would be no cumulative effects.

VCU 5950 (Steelhead) – VCU 5950 currently maintains 70 percent of the original total POG present in 1954, of which 28 percent would be included in the modified OGR (an increase of 8 percent). Approximately 65 acres could be harvested in VCU 5950 under the Control Lake timber harvest project.

VCU 5960 (Control Lake) – VCU 5960 currently maintains 98 percent of the original total POG present in 1954, of which 19 percent would be included in the modified OGR (an increase of 12 percent). It is considered an intact landscape as defined in the Forest Plan FEIS (i.e., maintaining more than 95 percent of its original POG; USDA Forest

Service 2008c). Approximately 88 acres could be harvested in VCU 5960 under the Control Lake timber harvest project.

VCU 5972 (Angel Lake) – VCU 5972 currently maintains 65 percent of the original total POG present in 1954, of which 20 percent would be included in the modified OGR (an increase of less than 1 percent). This modification would also result in the inclusion of approximately 3 percent of the original POG in adjacent VCU 5980 in the reserve system. Approximately 256 acres could be harvested in VCU 5972 under the Control Lake timber harvest project.

Timber Resources

Modifications of the small OGRs resulted in changes in LUD allocations (see Table OGR-1). If an area was reallocated to a development LUD, that area was then considered for possible timber harvest. A LSTA (logging system and transportation analysis) was done to determine logical logging settings using aerial photos and GIS information as described in the Alternative Development section in Chapter 2. This resulted in the potential mapped suitable and available acres shown in Table OGR-3. These acres were then field-verified to identify proposed timber harvest units. During field verification, some of these acres were found to be unsuitable for timber production for resource concerns usually related to soils. Other acres not mapped during the original LSTA development were found to be suitable. In addition, access may have improved to some areas that were originally allocated to development LUDs but were not included in the proposed action and units were identified in these areas. Proposed units were identified and added to the alternatives; this information is shown on Table OGR-4. Modifications of the small OGRs resulted in changes in LUD allocations (see Table OGR-1). If an area was reallocated to a development LUD, that area was then considered for possible timber harvest.

Alternatives 1, 2, and 5

Direct and Indirect Effects

Under Alternatives 1, 2, and 5, there would be no change in OGR boundaries. Therefore, there would be no change in the acreage classified as suitable forest land (Table OGR-3). About 123,997 acres of the project area are currently in development LUDs and available for timber production (see Table OGR-1). Within these development LUDs, 48,477 acres are mapped as suitable for timber production. The small OGRs of the project area contain approximately 6,783 mapped acres that would be considered suitable for timber production if it were in a development LUD (Table OGR-3).

Cumulative Effects

No other present or reasonably foreseeable projects on Thorne Bay and Craig Ranger Districts would modify LUDs; therefore, there would be no cumulative effect on the amount of suitable forest land in the project area or on the Thorne Bay and Craig Ranger Districts. The project area would continue to provide about 16 percent of the mapped suitable land base on the Thorne Bay and Craig Ranger Districts.

Table OGR-3. Acres and Volume of Potential Mapped Suitable Timber[1/] Within Each Small OGR by Alternative, Change in Mapped Suitable and Available Timber[2/], and Summary Statistics

VCU	Alternatives 1, 2, and 5		Alternative 3		Alternative 4	
	Potential Mapped Suitable Forest Land in Small OGRs	Change in Mapped Suitable & Available Forest Land	Potential Mapped Suitable Forest Land in Small OGRs	Change in Mapped Suitable & Available Forest Land	Potential Mapped Suitable Forest Land in Small OGRs	Change in Mapped Suitable & Available Forest Land
Mapped Suitable Forest Land Acres						
5790	381	0	385	-4	519	-138
5800	596	0	822	-225	596	0
5810	953	0	433	+520	953	0
5820	259	0	265	-5	259	0
5830	504	0	427	+78	607	-103
5840	593	0	406	+188	593	0
5850	349	0	200	+149	480	-132
5860	309	0	117	+192	309	0
5950	1,231	0	1,178	+54	1,601	-370
5960	212	0	212	0	649	-437
5972	1,395	0	1,166	+229	1,667	-272
Subtotal	**6,783**	**0**	**5,610**	**+1,174**	**8,235**	**-1,451**
Mapped Suitable Timber Volume (Gross in MMBF) [3/]						
5790	12.7	0	13.2	-0.5	17.6	-4.9
5800	19.5	0	35.1	-15.6	35.3	-15.7
5810	35.1	0	17.7	+17.3	76.9	-41.8
5820	10.1	0	10.8	-0.8	19.1	-9.0
5830	9.8	0	9.5	+ 0.3	5.9	+4.0
5840	21.5	0	14.9	+6.6	35.9	-14.4
5850	11.8	0	7.4	+4.4	14.7	-2.9
5860	11.0	0	4.3	+6.6	15.4	-4.4
5950	41.7	0	42.5	-0.8	115.8	-74.1
5960	7.7	0	8.3	-0.7	47.1	-39.4
5972	47.5	0	41.2	+6.3	37.8	+9.7
Subtotal	**228.5**	**0**	**205.2**	**+23.2**	**421.4**	**-192.9**

Net Changes to Big Thorne Alternatives[4/]			
	Alts. 1, 2, & 5	**Alt. 3**	**Alt. 4**
Net Change in Number of Harvest Units due to OGR Modification	**0**	**+48**	**-8**
Net Change in Acres of Harvest Units due to OGR Modification	**0**	**+1,360**	**-95**
Net Change in Timber Volume (Gross MMBF) due to OGR Modification	**0**	**+39.2**	**-4.1**

1/ Potential mapped suitable forest land is based on the estimated area within an OGR that would be suitable forest land if the OGR was changed to a development LUD and uses GIS information to estimate suitability. It includes old and young growth.
2/ Mapped suitable and available timber is the area that qualifies as suitable and available for timber production based on GIS mapping.
3/ Based on average gross volumes per acre for high, medium, and low volstrata for old growth and 10 MBF/acre for young growth.
4/ Changes in number, area, and volume in harvest units as a result of OGR modifications for each alternative.

Table OGR-4. Effects of OGR Modifications on the Number of Units, Acres and Volume by VCU and Summary by Alternative for the Big Thorne project.

VCU	Alternatives 1, 2, and 5		Alternative 3		Alternative 4	
	Number of units	Field verified Suitable & Available Timber (acres)	Field verified Number of Units[1]/	Field verified Suitable & Available Timber (acres)	Field verified Number of Units[1]/	Field verified Suitable & Available Timber (acres)
Number of Units and Mapped Suitable Acres						
5780	0	0	+1	+20	-2	-13
5790	0	0	+1	+20	0	-13
5800	0	0	+7	+208	0	0
5810	0	0	+9	+276	0	0
5820	0	0	+1	+84	0	+25
5830	0	0	+2	+61	-1	-46
5840	0	0	+5	+213	0	0
5850	0	0	+2	+91	-2	-75
5860	0	0	+8	+205	0	
5950	0	0	+6	+77	-1	-21
5960	0	0	0	0	0	0
5972	0	0	+7	+105	+7, -9	+230, -226
Total	**0**	**0**	**+48**	**+1,360**	**-8**	**-95**
Mapped Suitable Timber Volume (Gross in MMBF)						
5780	0	0	+1	+0.9	-2	-0.5
5790	0	0	+1	+0.9	0	-0.5
5800	0	0	+7	+7.6	0	0
5810	0	0	+9	+10.3	0	0
5820	0	0	+1	+1.0	0	+0.2
5830	0	0	+2	+0.8	-1	-1.8
5840	0	0	+5	+3.5	0	0
5850	0	0	+2	+2.2	-2	-2.7
5860	0	0	+8	+6.5	0	0
5950	0	0	+6	+2.6	-1	-0.5
5960	0	0	0	0	0	0
5972	0	0	+7	+3.7	-2	-1.2
Total	**0**	**0**	**+48**	**+39.2**	**-8**	**-4.1**

1/ Also includes some portions of units.
2/ Based on average gross volumes per acre for high, medium, and low volstrata.

Alternative 3

Direct and Indirect Effects

Under Alternative 3, OGR boundaries would be modified. As a result, the lands available for timber production in development LUDs of the project area would decrease by 590 acres, but there would be a net increase of approximately 1,174 acres in mapped suitable forest lands (including both old growth and young growth). If all mapped suitable lands were verified to be suitable, an estimated 23.2 MMBF of additional timber volume (including an assumption of 10 MBF per acre for young growth) could be produced.

Under Alternative 3, the small OGRs of the project area would contain approximately 5,610 mapped acres that would be considered suitable for timber production if it were in a development LUD (Table OGR-3).

Alternative 3 includes 48 harvest units in previous OGRs and several portions of units covering 1,325 acres and producing about 35.6 MMBF of gross volume. The following paragraphs describe specific Big Thorne project effects for each VCU individually.

VCU 5790 (Gravelly Creek/Falls Creek) – Modifications to this small OGR would result in a net increase of 4 acres in mapped suitable forest land that is available for timber production. After field verification and LSTA refinement, one 19-acre cable-yarding unit was added to Alternative 3 in this VCU, producing about 0.7 MMBF of gross volume. Additional road construction required for this unit is limited to about 1,000 ft.

VCU 5800 (North Thorne River) – Modifications to this small OGR would result in a net decrease of 225 acres in mapped suitable forest land that is available for timber production. After field verification and LSTA refinement, seven harvest units covering about 206 acres and producing about 5.1 MMBF of gross volume were added to Alternative 3 in this VCU. The majority of timber would be harvested using helicopter yarding and the remainder by cable and shovel, requiring less than 1,000 feet of new road construction and 1.3 miles of reconstruction.

VCU 5810 (Luck Lake) – Modifications to this small OGR would result in a net increase of 520 acres in mapped suitable forest land that is available for timber production. After field verification and LSTA refinement, nine harvest units covering about 294 acres and producing about 7.8 MMBF of gross volume were added to Alternative 3 in this VCU. About half of this volume would be harvested by helicopter and the remainder by cable and shovel, requiring about 1.1 miles of new road construction and 1.3 mile of reconstruction.

VCU 5820 (Baird Peak) – Modifications to this small OGR would result in a net decrease of 5 acres in mapped suitable forest land that is available for timber production. However, after field verification and LSTA refinement, one full unit, totaling 61 acres of partial-cut harvest and producing about 0.7 MMBF of gross volume, was added to Alternative 3 in this VCU. These units would need to be harvested by helicopter and may require long yarding distances, unless a barge in Clarence Strait can be used.

VCU 5830 (Ratz Harbor) – Modifications to this small OGR would result in a net increase of 78 acres in mapped suitable forest land that is available for timber production. After field verification and LSTA refinement, two units totaling 64 acres of mostly partial-cut harvest and producing about 0.8 MMBF of gross volume were added to Alternative 3 in this VCU. Almost 90 percent of this volume would require helicopter yarding and no new road construction would be required.

VCU 5840 (Sal Creek) – Modifications to this small OGR would result in a net increase of 188 acres in mapped suitable forest land that is available for timber production. After field verification and LSTA refinement, five harvest units covering 213 acres (mostly partial cut) and producing about 4.4 MMBF of gross volume were added to Alternative 3 in this VCU. Almost 90 percent of this volume would require helicopter yarding and about 0.4 mile of road construction would be required.

VCU 5850 (Sandy Beach) – Modifications to this small OGR would result in a net increase of 149 acres in mapped suitable forest land that is available for timber production. After field verification and LSTA refinement, two full harvest units and one harvest unit shared with VCU 5860 covering 87 acres and producing 3.3 MMBF of gross volume were added to Alternative 3 in this VCU. Yarding would be mostly by shovel, with some cable, and about 2.1 miles of road construction would be required.

VCU 5860 (Thorne Bay/Snug Anchorage) – Modifications to this small OGR would result in a net increase of 192 acres in mapped suitable forest land that is available for timber production. After field verification and LSTA refinement, eight harvest units (including one harvest unit shared with VCU 5860) covering 203 acres and producing about 7.7 MMBF of gross volume were added to Alternative 3 in this VCU. This volume would be harvested almost entirely by shovel and cable yarding, would require about 3 miles of new road construction, and would require use of existing State roads for access.

VCU 5950 (Steelhead) – Modifications to this small OGR would result in a net increase of 54 acres in mapped suitable forest land that is available for timber production. After field verification and LSTA refinement, six harvest units covering 74 acres and producing 2.3 MMBF of gross volume were added to Alternative 3 in this VCU. Yarding would be about two-thirds by helicopter and, although no new roads would be required, about 1.8 miles of road reconstruction would be necessary.

VCU 5960 (Control Lake) – No modifications to the small OGR in VCU 5960 are proposed under Alternative 3.

VCU 5972 (Angel Lake) – Modifications to this small OGR would result in a net increase of 229 acres in mapped suitable forest land that is available for timber production. After field verification and LSTA refinement, seven harvest units covering 104 acres and producing 2.7 MMBF of gross volume were added to Alternative 3 in this VCU. About one-third of the volume would be yarded by helicopter, with shovel and cable yarding for the rest. About 0.3 mile of road construction would be necessary.

Cumulative Effects

No other present or reasonably foreseeable projects on the Thorne Bay and Craig Ranger Districts are expected to result in LUD modifications. Therefore, cumulative effects on the amount of suitable forest land on the Thorne Bay and Craig Ranger Districts are expected to be the same as the direct and indirect effects. This change would result in a 0.4 percent increase in the mapped suitable forest land on the Thorne Bay and Craig Ranger Districts.

Alternative 4

Direct and Indirect Effects

Under Alternatives 4, OGR boundaries would be modified. As a result, the lands available for timber production in development LUDs of the project area would decrease by 4,288 acres and mapped suitable forest lands would decrease by approximately 1,451 acres (including both old growth and young growth). If all mapped suitable lands were verified to be suitable, an estimated 61.1 MMBF less gross timber volume (including an

assumption of 10 MBF per acre for young growth) could be produced from development LUDs (Table OGR-3).

Relative to the Big Thorne project, an LSTA for the additional mapped suitable acres was developed and field investigations were conducted. As a result, many of the mapped suitable acres were determined not to be suitable due to soils concerns and other resource issues, and some acres were deferred (including the young growth). Alternative 4 includes 7 new harvest units in previous OGRs on 230 acres, producing about 4.5 MMBF of gross volume. However, 15 units covering about 440 acres and producing 16.7 MMBF of gross volume would be eliminated by new OGRs. The following paragraphs describe specific Big Thorne project effects for each VCU with OGR modifications.

VCU 5790 (Gravelly Creek/Falls Creek) – Modifications to this small OGR, would expand the OGR into VCU 5780, connecting it to the Honker Divide large OGR. This expansion would result in a net decrease of 138 acres in mapped suitable forest land that is available for timber production and would result in the elimination of two units covering 35 acres in the Big Thorne project, reducing the gross volume of Alternative 4 by about 1.3 MMBF. No additional harvest units would become available.

VCU 5800 (North Thorne River) – No modifications to the small OGR in VCU 5800 are proposed under Alternative 4.

VCU 5810 (Luck Lake) – No modifications to the small OGR in VCU 5810 are proposed under Alternative 4.

VCU 5820 (Baird Peak) – No modifications to the small OGR in VCU 5820 are proposed under Alternative 4, except that it does not include any area contributed by VCU 5830.

VCU 5830 (Ratz Harbor) – Modifications to this small OGR would result in a net decrease of 103 acres in mapped suitable forest land that is available for timber production. One harvest unit would be excluded from Alternative 4; it covers 50 acres, would include cable, shovel, and helicopter yarding, and would produce about 1.9 MMBF of gross volume. It would require 0.6 mile of road construction and 0.6 mile of reconstruction.

VCU 5840 (Sal Creek) – No modifications to the small OGR in VCU 5840 are proposed under Alternative 4.

VCU 5850 (Sandy Beach) – Modifications to this small OGR would result in a net decrease of 132 acres in mapped suitable forest land that is available for timber production. About 91 acres of two harvest units would be eliminated from Alternative 4. This would result in a 3.5 MMBF reduction in the gross volume of Alternative 4. Elimination of these units would also eliminate about 1 mile of road construction.

VCU 5860 (Thorne Bay/Snug Anchorage) – No modifications to the small OGR in VCU 5860 are proposed under Alternative 4.

VCU 5950 (Steelhead) – Modifications to this small OGR would result in a net decrease of 370 acres in mapped suitable forest land that is available for timber production. About 38 acres of harvest units (all of one and part of another) would be eliminated from Alternative 4. This would result in a 1.4 MMBF reduction in the gross volume of

Alternative 4. Elimination of these units would also eliminate about 0.4 mile of road construction.

VCU 5960 (Control Lake) – Expansions of the small OGR in VCU 5960 are proposed under Alternative 4. This would result in a 437-acre net decrease in mapped suitable forest land that is available for timber production. These reductions would not directly affect Big Thorne harvest units because the expansions are essentially entirely in roadless.

VCU 5972 (Angel Lake) – Modifications to this small OGR under Alternative 4 would result in a net decrease of 272 acres in mapped suitable forest land that is available for timber production. They would have major effects on the Big Thorne project. First, they would result in the addition of 7 harvest units to Alternative 4 covering 230 acres, producing about 4.5 MMBF of gross volume, and requiring about 0.8 mile of road construction. About three-quarters of these acres would be helicopter harvest. In addition, the modifications would eliminate 9 units covering about 226 acres, producing about 8.6 MMBF of gross volume, and requiring 3.7 miles of new road construction and 0.5 mile of reconstruction. The eliminated units are over 90 percent cable and shovel. The net effect would be a 4.1 MMBF decrease in Alternative 4 volume, but the added units would have a much higher proportion of helicopter yarding than the dropped units, decreasing the economics of the harvest.

Cumulative Effects

No other present or reasonably foreseeable projects on Thorne Bay and Craig Ranger Districts are expected to result in LUD modifications. Therefore, cumulative effects on the amount of suitable forest land in the project cumulative effects area or on the Thorne Bay and Craig Ranger Districts are expected to be the same as direct and indirect effects. This change would result in a 0.5 percent decrease in the mapped suitable forest land on the Thorne Bay and Craig Ranger Districts.

Fish Resources

A number of stream miles that are in existing OGR would now be converted to development LUDs, while some streams that were in development LUDs would now be in OGRs. The exchange of land classifications would primarily be transferring already roaded areas of OGRs to timber harvest areas, while existing roadless areas would be transferred to OGR categories.

Alternatives 1, 2, and 5

Direct and Indirect Effects

Under Alternatives 1, 2, and 5, small OGR boundaries would not be modified so the watershed acres and stream miles within small OGRs would remain unchanged.

Cumulative Effects

No other present or reasonably foreseeable projects in the cumulative effects area would modify LUDs, and effects on fish resources of individual development projects are expected to be within the limits allowed by the Forest Plan and are analyzed separately and cumulatively as they are proposed.

Alternative 3

Direct and Indirect Effects

Alternative 3 would result in OGR boundary modifications, exchanging roaded portions of existing OGRs for roadless lands that are currently in Modified Landscape and Timber Production LUDs. The result would be that some existing OGR areas would be open to timber harvest under Alternative 3 while some roadless areas that were in Modified Landscape and Timber Production LUDs, would become OGR and would be closed to timber harvest.

These land allocation changes, however, are not expected to result in any adverse effects to fish resources independent of those addressed in other portions of this document. While more stream miles, including anadromous fish streams, would be placed in potential harvest areas under Alternative 3 the standards and guidelines and BMPs in place for timber harvest to protect riparian habitats and fish resources will be adequate to ensure that no additional adverse effects occur to fish resources in the project area.

OGR acres converted to development LUD acres could disproportionally open up more acres to harvest and roads in watersheds that are already heavily harvested/roaded. Under Alternative 3, this occurs with small acreages in Pin, Salamander, and Big Salt Lake subwatersheds. Based on the metrics used to measure potential cumulative watershed effects (see later in this chapter), these subwatersheds have exceedances when reasonably foreseeable actions are included (North Big Salt Lake exceeds the 20 percent of basin area harvest threshold, Salamander exceeds the 2.5 percent of basin area in roads threshold, and Pin exceeds both of these thresholds). However, essentially the entire amount of additional allowable harvest in these subwatersheds due to OGR changes is analyzed and disclosed for Alternative 3 in the Issue 4 - Cumulative Watershed Effects section of this chapter. If any additional unforeseen projects are proposed in these subwatersheds or other subwatersheds in the future, effects would be analyzed and disclosed as they are proposed in future environmental analyses.

Cumulative Effects

Cumulative effects to fish resources associated with these land allocation changes are expected to be very minor. While more stream miles, including anadromous fish streams, would be placed in potential harvest areas under Alternative 3, Forest Plan standards and guidelines and BMPs in place for timber harvest to protect riparian habitats and fish resources would be adequate to protect against adverse effects to fish resources in the project area. As noted above, the subwatersheds with potential effects related to cumulative harvest and cumulative road development are analyzed in the Issue 4 – Cumulative Watershed Effects section of this chapter. No other present or reasonably foreseeable projects in the area would modify LUDs, and effects on fish of individual development projects are expected to be within the limits allowed by the Forest Plan and are analyzed separately and cumulatively as they are proposed.

Alternative 4

Direct and Indirect Effects

Alternative 4 would result in OGR boundary modifications, so that the small OGRs of the project area match the biologically preferred arrangement. Some existing OGR areas would be open to timber harvest, while a much larger acreage of development LUD areas would become OGR and generally be closed to timber harvest. As a result, a number of stream miles that are in existing OGRs would be converted to development LUDs, while many more streams that were in development LUDs would be in OGRs.

After the exchanges, the number of Class I, II, III, and IV stream miles in OGRs would each increase (Table OGR-2). As noted above, OGR acres converted to development LUD acres could disproportionally open up more acres to harvest and roads in watersheds that are already heavily harvested/roaded. Under Alternative 4, none of the areas being converted to development LUDs are in subwatersheds with metrics for cumulative harvest or cumulative roads that are exceeding the subwatershed thresholds used, even when reasonably foreseeable actions are included. Subwatersheds with potential effects related to cumulative harvest and cumulative road development are analyzed in the Issue 4 – Cumulative Watershed Effects section.

Cumulative Effects

Cumulative effects to fish resources associated with these land allocation changes are expected to be very minor, but positive. While more stream miles, including anadromous fish streams, would be placed in OGRs under Alternative 4, Forest Plan standards and guidelines and BMPs in place for timber harvest to protect riparian habitats and fish resources would be adequate to protect against adverse effects to fish resources in the project area in any event. Further, no other present or reasonably foreseeable projects in the area would modify LUDs, and effects on fish of individual development projects are expected to be within the limits allowed by the Forest Plan and are analyzed separately and cumulatively as they are proposed.

Sensitive and Rare Plant Resources

This section analyzes the effects of changes in land use designations on sensitive and rare plants over the long-term.

Alternatives 1, 2, and 5

Direct, Indirect, and Cumulative Effects

Under Alternatives 1, 2, and 5, there would be no change in OGR boundaries. Therefore, there would be no change in the long-term protection of sensitive and rare plants provided by OGRs.

Old-growth reserves in the project area would continue to include 40 percent of the known plants and at least a portion of 25 percent of the known populations for the lesser round-leaved orchid. Other non-development LUDs would continue to include an additional 23 percent of the known plants (total of 63 percent in non-development LUDs), and at least a portion of an additional 12 percent of the known populations (total of 35 percent in non-development LUDs).

In addition, OGRs under these alternatives would continue to include 51 percent of the known plants and at least a portion of 43 percent of the known populations of the whiteflower rein orchid. No known plants or populations occur in other non-development LUDs. These large percentages are important, in that OGRs and other non-development LUDs are more likely to result in protection of sensitive and rare plant habitats than are areas in development LUDs.

Ten of the 15 populations of the rare plant, western meadowrue, would continue to occur within small OGRs in the project area. The only two known populations of the northern moonwort in the project area are known to occur within the Honker Divide large OGR.

There are no other reasonably foreseeable changes to the LUD designations within the project area. Direct, indirect, and cumulative effects of past, present, and reasonably foreseeable development projects on sensitive and rare plants for these alternatives are described under the Botany section of this chapter.

Alternative 3

Direct and Indirect Effects

The number of lesser round-leaved orchid plants known within OGRs would be reduced by 51 percent (from 1,606 to 781 plants) and the number of populations partially or fully within OGRs would be reduced by 23 percent (from 30 to 23 populations). Old-growth reserves would include about 19 percent of the known plants and 19 percent of the known populations in the project area; however, all non-development LUDs combined would include about 43 percent of the known plants and at least a portion of 32 percent of the known populations (compared with 63 percent and 35 percent under Alternatives 1, 2, and 5).

The number of whiteflower rein orchid plants known within OGRs would be reduced by 14 percent (from 673 to 580 plants) and the number of populations partially or fully within OGRs would be reduced by 31 percent (from 13 to 9 populations). Old-growth Reserves would include about 44 percent of the known plants and at least a portion of 30 percent of the known populations in the project area (compared with 51 percent and 43 percent under Alternatives 1, 2, and 5). None of these populations are located within proposed timber harvest units or new road construction for this project.

Seven of the 10 populations of western meadowrue that occur entirely or partially within OGRs would continue to occur within OGRs after implementation of Alternative 3. However, two populations in VCU 5800, one population in VCU 5950, and a portion of one population in VCU 5972 are in areas that would be converted to development LUDs. No effects to other known sensitive or rare plant populations would occur as a result of OGR boundary modifications.

Cumulative Effects

Areas with the allocations changed from OGRs to development LUDs would not all be subject to timber harvest. Even over the long term, only areas mapped as suitable forest land would be targeted for harvest.

Less than half of the lesser round-leaved orchid plant locations known to occur in OGRs under existing conditions, are mapped as POG and some of these areas would be

unsuitable for timber production (due to standards and guidelines, e.g., riparian buffers, legacy). Given that a small percentage (<10 percent) of these plants may also occur in young growth, which could also be suitable, only about half of the plants in areas that would change to development LUDs are expected to be subject to timber harvest over the long term.

Similarly, less than 20 percent of the whiteflower rein orchid plant locations known to occur in OGRs under existing conditions are mapped as POG and some of these areas would be unsuitable for timber production (due to standards and guidelines, e.g., riparian buffers, legacy). Given that a small percentage (<10 percent) of these plants also occurs in young growth, which could also be suitable, less than a third of the plants in areas that would change to development LUDs are expected to be subject to timber harvest over the long term.

Four of the 10 populations of western meadowrue are entirely or partially located in areas that would be converted to development LUDs. This change would reduce the percentage of western meadowrue plants that occur in OGRs from about 56 percent to about 30 percent, increasing the number of individuals that would be subject to commercial timber harvest over the long term.

Further, no other present or reasonably foreseeable projects in the project area would modify LUDs, and effects of individual projects on sensitive and rare plants would be analyzed separately and cumulatively when they are proposed. Direct, indirect, and cumulative effects of past, present, and reasonably foreseeable development projects on sensitive and rare plants for Alternative 3 are analyzed and described under the Botany section of this chapter.

Alternative 4

Direct and Indirect Effects

The number of lesser round-leaved orchid plants known within OGRs would increase by 5 percent (from 1,606 to 1,690 plants) and the number of populations partially or fully within OGRs would increase by 70 percent (from 30 to 51 populations). Old-growth reserves would include about 42 percent of the known plants and 42 percent of the known populations in the project area; however, all non-development LUDs combined would include about 65 percent of the known plants and at least a portion of 55 known populations (compared with 63 percent and 35 percent under Alternatives 1, 2, and 5).

The number of whiteflower rein orchid plants known within OGRs would increase by 15 percent (from 673 to 776 plants) and the number of populations partially or fully within OGRs would increase by 31 percent (from 13 to 17 populations). Old-growth Reserves would include about 59 percent of the known plants and at least a portion of 57 percent of the known populations in the project area (compared with 51 percent and 43 percent under Alternatives 1, 2, and 5).

One of the 10 populations of western meadowrue that occurs within a small OGR would increase its areal coverage within the OGR and another population would decrease its coverage. However, all 10 populations would continue to at least partially occur within a OGRs after implementation of Alternative 4. The number of individual plants occurring in OGRs would decrease from 56 percent to 42 percent. No effects to other known

sensitive or rare plant populations would occur as a result of OGR boundary modifications.

Cumulative Effects

Alternative 4 results in a net increase in the number of sensitive plants included in OGRs. Areas being converted from development LUDs to OGRs were not all originally subject to timber harvest. Even over the long term, only areas mapped as POG and suitable for timber production can be targeted for harvest.

Less than half of the lesser round-leaved orchid plant locations known to occur in OGRs under existing conditions, are mapped as POG and some of these areas would be unsuitable for timber production (due to standards and guidelines). Given that a small percentage (<10 percent) of these plants may also occur in young growth, which could also be suitable, only about half of the plants in areas that would change to development LUDs are expected to be subject to timber harvest over the long term.

Similarly, less than 20 percent of the whiteflower rein orchid plant locations known to occur in OGRs under existing conditions, are mapped as POG and some of these areas would be unsuitable for timber production (due to standards and guidelines). Given that a small percentage (<10 percent) of these plants also occurs in young growth, which could also be suitable, less than a third of the plants in areas that would change to development LUDs are expected to be subject to timber harvest over the long term.

Two of the 10 populations of western meadowrue partially or entirely occurring in OGRs would be affected; however, all ten would continue to be partially or entirely located in OGRs. This change would reduce the percentage of western meadowrue plants that occur in OGRs from about 56 percent to about 42 percent, increasing the number of individuals that would be subject to commercial timber harvest over the long term. Further, no other present or reasonably foreseeable projects in the project area would modify LUDs, and effects of individual projects on sensitive and rare plants would be analyzed separately and cumulatively when they are proposed. Direct, indirect, and cumulative effects of past, present, and reasonably foreseeable development projects on sensitive and rare plants for Alternative 4 are analyzed and described under the Botany section of this chapter.

Scenery Resources

Alternatives 1, 2, and 5

Direct, Indirect, and Cumulative Effects

Under Alternatives 1, 2, and 5, there would be no change in OGR boundaries. As a result, there would be no change in Scenic Integrity Objectives (SIO)s in the project area.

Cumulative Effects

No other present or reasonably foreseeable projects in the area would modify LUDs, and visual disturbances of individual development projects are expected to be within the limits allowed by the Forest Plan and are analyzed separately and cumulatively as they are proposed.

Alternative 3

Direct and Indirect Effects

Alternative 3 would change OGR boundaries, resulting in changes in SIOs. Approximately 5,873 acres would change from high SIO (existing OGRs) to moderate, low, or very low. Similarly, 6,462 acres of moderate, low, and very low (existing development LUDs) would change to high SIO (in expanded OGRs).

None of the OGR modifications would result in conversion to Scenic Viewshed LUD; however, some acres of scenic viewshed would be converted to OGR in VCU 5950. Areas of potential concern where OGR conversion to Modified Landscape LUD would occur are located in VCU 5810 (north of Luck Lake), VCU 5840 (along the 3000 Road north of Sal Creek), and VCU 5850 (south of Sandy Beach). Some portions of these areas would be visible from visual priority routes and use areas. Although the SIO in these areas would generally decline as a result of conversion to Modified Landscape, the 2008 Forest Plan designated all adjacent areas with similar visual concern levels (and even those adjacent areas that are more visually sensitive) as Modified Landscape as well. A combination of partial harvest, the use of visual screens, and the placement of required legacy, in harvest units in these areas would mitigate harvest sufficiently to meet required SIOs.

Cumulative Effects

Cumulative visual effects associated with the OGR changes are expected to be low. No other present or reasonably foreseeable projects in the cumulative effects area would modify LUDs, and visual disturbances of individual development projects are expected to be within the limits allowed by the Forest Plan and are analyzed separately and cumulatively as they are proposed.

Alternative 4

Direct and Indirect Effects

Alternative 4 would change OGR boundaries, resulting in changes in SIOs. Approximately 2,679 acres of the existing OGRs would change from high SIO to low or very low. Similarly, 6,950 acres of high, moderate, low, and very low SIOs in the development LUDs would change to high SIO in OGRs.

None of the OGR modifications would result in conversion to Scenic Viewshed LUD; however, some acres of Scenic Viewshed would be converted to OGR in VCU 5950. No significant areas of concern would result, where OGR conversion to Modified Landscape LUD would occur. In addition, several areas of Modified Landscape LUD would be added to OGRs in VCUs 5820, 5850, and 5972.

Cumulative Effects

Cumulative visual effects associated with the OGR changes are expected to be low. No other present or reasonably foreseeable projects in the cumulative effects area would modify LUDs, and visual disturbances of individual development projects are expected to be within the limits allowed by the Forest Plan and are analyzed separately and cumulatively as they are proposed.

Recreation Resources

Alternatives 1, 2, and 5

Direct, Indirect, and Cumulative Effects

Under Alternatives 1, 2, and 5, there would be no change in OGR boundaries and no related changes to ROS and patterns of recreation use in the Big Thorne project area.

Cumulative Effects

No other present or reasonably foreseeable projects in the cumulative effects area would modify LUDs, and effects on recreation resources of individual development projects are expected to be within the limits allowed by the Forest Plan and are analyzed separately and cumulatively as they are proposed.

Alternative 3

Direct and Indirect Effects

Under Alternative 3, there would be changes to the small OGRs in the project area. Total acres in the small OGRs would have a net increase of about 590 acres under this alternative; however, many additional acres would change. Overall, there would be a net gain of 4,220 acres in Semi-Primitive Recreation Opportunity Spectrum settings and an overall decrease in acres in Roaded ROS settings (-3,630 acres) in small OGRs. This change would be consistent with the general goal of the Old-growth Habitat LUD to provide Semi-Primitive ROS settings. The overall project-wide changes in ROS settings that would occur as a result of this alternative are shown in Table REC-5 in the Recreation section below. Viewed in terms of the project area, the resulting changes would represent a small share of the affected settings and would not be likely to affect recreation and tourism.

Harvest under this alternative in former OGR areas would occur relatively close to two of the 13 developed recreation sites in the Big Thorne project area: Thorne Lake, which is part of the Honker Divide Canoe Route and the Luck Lake Day Use Area. These areas are described below in the Recreation section. Noise and other activity associated with harvest in the former OGR area northeast of Thorne Lake would be apparent to people traveling this part of the Canoe Route and would affect the quality of their remote recreation experience. Noise and other activity associated with harvest in the former OGR area north of Luck Lake would likely to be apparent to people using the day use area and recreating on the lake. In both cases, these impacts would be temporary.

The Scenery Resources analysis (above) identified three areas of potential visual concern associated with the conversion of OGR lands to the Modified Landscape LUD, but concluded that a combination of partial harvest prescriptions, the use of visual screens, and the placement of required legacy in harvest units in these areas would mitigate harvest sufficiently to meet required SIOs; impacts to scenery would, therefore, not be expected to affect the quality of the recreation experience in these areas.

Cumulative Effects

Cumulative effects to recreation resources associated with the OGR changes are expected to be low. No other present or reasonably foreseeable projects in the cumulative effects area

would modify LUDs, and effects on recreation resources of individual development projects are expected to be within the limits allowed by the Forest Plan and are analyzed separately and cumulatively as they are proposed.

Alternative 4

Direct and Indirect Effects

Under Alternative 4, the boundaries of the small OGRs in the project area would be modified to correspond with the biologically preferred arrangement for the project area (as developed by an interagency team). Net acres in the small OGRs in the project area would increase by about 4,271 under this alternative, with a net gain of 400 acres in Semi-Primitive ROS settings and 3,900 acres in Roaded ROS settings within small OGRs. The overall project-wide changes in ROS settings that would occur as a result of this alternative are shown in Table REC-5 in the Recreation section below. Viewed in terms of the project area, the resulting changes would represent a small share of the affected settings and would not be likely to affect recreation and tourism.

The Scenery Resources analysis (above) indicated that significant changes to scenery with the potential to affect the quality of the recreation experience in adjacent or nearby areas would be expected to occur.

Cumulative Effects

Cumulative effects to recreation resources associated with the OGR changes are expected to be low. No other present or reasonably foreseeable projects in the cumulative effects area would modify LUDs, and effects on recreation resources of individual development projects are expected to be within the limits allowed by the Forest Plan and are analyzed separately and cumulatively as they are proposed.